Draft U.S. Pacific Marine Mammal Stock Assessments: 2006

by

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NOAA-TM-NMFS-SWFSC Technical Memorandum

U. S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center

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The following stock assessment reports and appendices were revised in 2006. All others will be reprinted as they appear in the 2005 Pacific Region Stock Assessment Reports (Carretta *et al.* 2005).

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PREFACE

Under the 1994 amendments to the Marine Mammal Protection Act (MMPA), the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) are required to publish Stock Assessment Reports for all stocks of marine mammals within U.S. waters, to review new information every year for strategic stocks and every three years for non-strategic stocks, and to update the stock assessment reports when significant new information becomes available. This draft 2006 Pacific Region report presents revised stock assessments for 9 Pacific marine mammal stocks under NMFS jurisdiction: 1) Northern fur seal, San Miguel Island stock; 2) Hawaiian monk seal; 3) Hawaii bottlenose dolphin; 4) Hawaii false killer whale; 5) Hawaii short-finned pilot whale; 6) Southern Resident killer whale; 7) Oregon/Washington coast harbor porpoise; 8) Washington Inland Waters harbor porpoise; and 9) California coastal bottlenose dolphin. Information on the remaining 52 Pacific region stocks appears in the 2005 Pacific Region reports (Carretta *et al.* 2006). Stock Assessments for Alaskan marine mammals are published by the National Marine Mammal Laboratory (NMML) in a separate report. There is no current stock assessment report for the California stock of sea otters, which was last revised in 1995. A Recovery Plan for the Washington state stock of sea otters (Lance et al. 2004) can be found at the Washington Department of Fish and Wildlife website:

http://wdfw.wa.gov/wlm/diversty/soc/recovery/seaotter/index.htm

The nine revised stock assessments in this report include those studied by the Southwest Fisheries Science Center (SWFSC, La Jolla, California), the Pacific Islands Fisheries Science Center (PIFSC, Honolulu, Hawaii), the National Marine Mammal Laboratory (NMML, Seattle, Washington), and the Northwest Fisheries Science Center in Seattle, WA. Staff of the Northwest Fisheries Science Center prepared the report on the Eastern North Pacific Southern Resident killer whale. Pacific Islands Fisheries Science Center staff prepared the report on the Hawaiian monk seal. National Marine Mammal Laboratory staff prepared reports for harbor porpoise and northern fur seal stocks. Southwest Fisheries Science Center staff prepared stock assessments the California coastal stock of bottlenose dolphin and Hawaii stocks of short-finned pilot whale, bottlenose dolphin, and false killer whale. Updated estimates of abundance are presented for Southern Resident killer whales, Hawaiian monk seals, California coastal bottlenose dolphins, two harbor porpoise stocks in Oregon and Washington, the San Miguel Island stock of northern fur seal, and Hawaii stocks of false killer whale, short-finned pilot whale, and bottlenose dolphin. Potential biological removal (PBR) values are also updated for those stocks where new abundance estimates are available. The report for southern resident killer whales has been updated to reflect the new endangered status for this stock as of December 2005. New information on human-related strandings has been incorporated into the California coastal bottlenose dolphin stock assessment. New information on U.S. commercial fisheries that may interact with marine mammals is presented in Appendix 1.

Earlier versions of these stock assessment reports were reviewed by the Pacific Scientific Review Group in November 2005. The authors also wish to thank those who provided unpublished data, especially Robin Baird and Joseph Mobley, who provided valuable information on Hawaiian cetaceans. Any omissions or errors are the sole responsibility of the authors.

This is a working document and individual stock assessment reports will be updated as new information becomes available and as changes to marine mammal stocks and fisheries occur. Background information and guidelines for preparing stock assessment reports are reviewed in Wade and Angliss (1997). The authors solicit any new information or comments which would improve future stock assessment reports.

These Stock Assessment Reports summarize information from a wide range of sources and an extensive bibliography of all sources is given in each report. We strongly urge users of this document to refer to and cite original literature sources rather than citing this report or previous Stock Assessment Reports. If the original sources are not available, the citation should follow the format: [Original source], as cited in [this Stock Assessment Report citation].

References:

Carretta, J.V., K.A. Forney, M.M. Muto, J. Barlow, J. Baker, Brad Hanson, and M. Lowry. 2006. U.S. Pacific Marine Mammal Stock Assessments: 2005. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-388. 317p.

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Revised ~~11/01/2005~~ 05/15/2006

HAWAIIAN MONK SEAL (*Monachus schauinslandi*)

STOCK DEFINITION AND GEOGRAPHIC RANGE

Hawaiian monk seals are distributed predominantly in six Northwestern Hawaiian Islands (NWHI) subpopulations at French Frigate Shoals, Laysan and Lisianski Islands, Pearl and Hermes Reef, and Midway and Kure Atoll. Small numbers also occur at Necker, Nihoa, and the main Hawaiian Islands (MHI). Genetic variation among NWHI monk seals is extremely low and may reflect both a long-term history at low population levels and more recent human influences (Kretzmann et al. 1997, 2001). On average, 10-15% of the seals migrate among the NWHI subpopulations (Johnson and Kridler 1983; Harting 2002). Thus, the NWHI subpopulations are not isolated, though the different island subpopulations have exhibited considerable demographic independence. Observed interchange of individuals among the NWHI and MHI regions is extremely rare, suggesting these may be more appropriately designated as separate stocks. Further evaluation of a separate MHI stock will be pursued following genetic stock structure analysis (currently underway) and additional studies of MHI monk seals. In the mean time, the species is managed as a single stock.

POPULATION SIZE

The best estimate of the total population size is 1,302~~1,252~~. This estimate is the sum of estimated abundance ~~counts~~ at the six main Northwest Hawaiian Islands subpopulations, an extrapolation of counts at Necker and Nihoa Islands, and counts at the main Hawaiian Islands. In this report, a new method is used to estimate abundance of the main reproductive subpopulations. ~~is currently~~Formerly, the number of seals identified (using flipper tags, applied bleach marks and natural markings) at each site was tallied, but there was little evaluation of how many seals may have been overlooked. Baker, Harting and Johanos (in review), developed a procedure to determine whether total enumeration had been achieved at a given subpopulation. In such cases, the total number of seals identified was used as the population estimate. At sites where total enumeration was not achieved, capture-recapture estimates from Program CAPTURE were used (Baker 2004; Otis et al. 1978, Rexstad & Burnham 1991, White et al. 1982). When no reliable estimator was obtainable in Program CAPTURE (i.e., the model selection criterion was < 0.75, following Otis et al. 1978), the total number of seals identified was the best available estimate. Finally, sometimes capture-recapture estimates are less than the known minimum abundance (Baker 2004), and in these cases the total number of identified was used. ~~though efforts to develop improved methods are underway (Baker 2004, Baker et al. in review). Individual seals are identified by flipper tags and applied bleach marks, and distinctive natural features such as scars and pelage patterns~~. In 2004~~2003~~, identification efforts were conducted during two- to six-month studies at all main reproductive sites. Total enumeration was achieved at all sites except French Frigate Shoals and Pearl and Hermes Reef. Reliable capture-recapture estimates at the latter two sites were not obtained, so minimum abundance estimates were used. A total of 1,150~~1,100~~ seals (including 207~~180~~ pups) were observed at the main reproductive subpopulations in 2004~~2003~~ (Johanos and Baker, in press). ~~The estimated probability that known-aged seals are identified during a given field season average over 90% at French Frigate Shoals, Laysan Island, Midway Atoll and Kure atoll; approximately 85% at Lisianski Island, and approximately 80% at Pearl and Hermes Reef (Harting 2002). These probabilities likely represent the potential extent of negative bias in enumerating the subpopulations.~~

Monk seals also occur at Necker and Nihoa Islands, where counts are conducted from zero to a few times in a single year. Abundance is estimated by correcting the mean of all beach counts accrued over the past five years. The mean (±SD) of all counts (excluding pups) conducted between 2000-2004 ~~1999-2003~~ were 15.4 (±4.2) ~~16.4 (±6.9)~~ at Necker Island and 17.3 (±8.1) ~~17.0 (±7.6)~~ at Nihoa Island (~~Johanos and Ragen 1999;~~ Johanos and Baker ~~2000, 2001,~~ 2002, 2004, 2005, in press). The relationship between mean counts and total abundance at the reproductive sites indicates that the total abundance can be estimated by multiplying the mean count by a correction factor ~~(±SE)~~ of 2.89 (~~±0.06,~~ NMFS unpubl. data). Resulting estimates (plus the average number of pups known to have been born during 2000-2004 ~~1997-2001~~) are 45.8 (±12.2) ~~48.5 (± 19.9)~~ at Necker Island and 52.9 (±23.5) ~~51.7 (± 22.1)~~ at Nihoa Island.

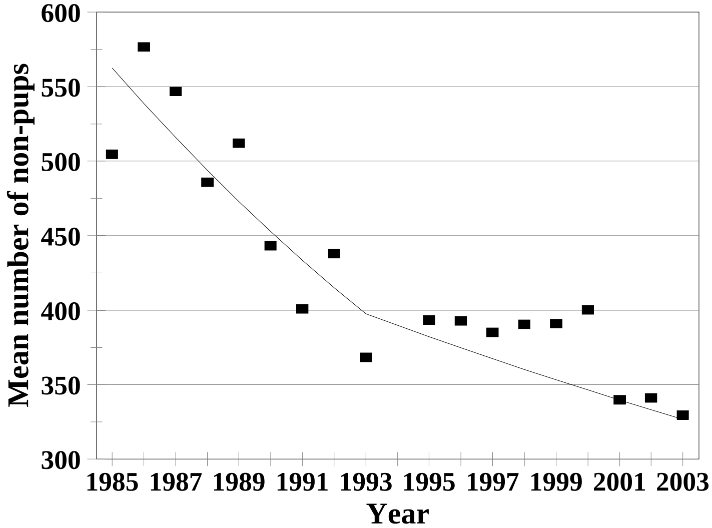
A 2001 aerial survey determined a minimum abundance of 52 seals in the MHI; this ~~and~~ remains the most recent available estimate (Baker and Johanos 2004). Seals in the MHI include those naturally occurring and any animals remaining from 21 seals translocated from the NWHI in 1994.

Minimum Population Estimate

The total number of seals identified at the six main NWHI reproductive sites is the best estimate of minimum population size at those sites (i.e., 1,150 ~~1,100~~ seals). Minimum population sizes for Necker and Nihoa Islands (based on the formula provided by Wade and Angliss (1997) are 37 at both islands ~~35 and 37, respectively~~. The minimum abundance estimate for the main Hawaiian Islands based upon the 2001 aerial survey is 52 seals. The minimum population size for the entire stock (species) is the sum of these estimates, or 1,276 ~~1,224~~ seals.

Current Population Trend

The total of mean non-pup beach counts at the six main reproductive NWHI subpopulations in 2004~~2003~~ is approximately 60% lower than in 1958. In previous Stock Assessment Reports, average non-pup beach counts were used to characterize the population trend (Fig. 1a). A better representation is achieved using the trend in total abundance at the six main NWHI subpopulations estimated as described above (Fig. 1b). A log-linear regression of estimated abundance on year from 1998 (the first year for which a reliable total abundance estimate has been obtained) to 2004 estimates that abundance declined on average -3.8% yr^{-1} (95% CI = -5.5% to -2.1% yr^{-1}). ~~log-linear broken-line regression (two lines joined at a break point) is fitted with the break point chosen to minimize the sum of squares error[1]. This method estimates that the total counts declined 4.2% yr⁻¹ until 1993, then declined at 1.9% yr⁻¹ thereafter (Fig. 1). The broken line regression fit significantly better than a single regression line (p = 0.05). Thus, current population trend is estimated as -1.9 yr⁻¹ (95% CI = -3.0% to -0.9% yr⁻¹).~~



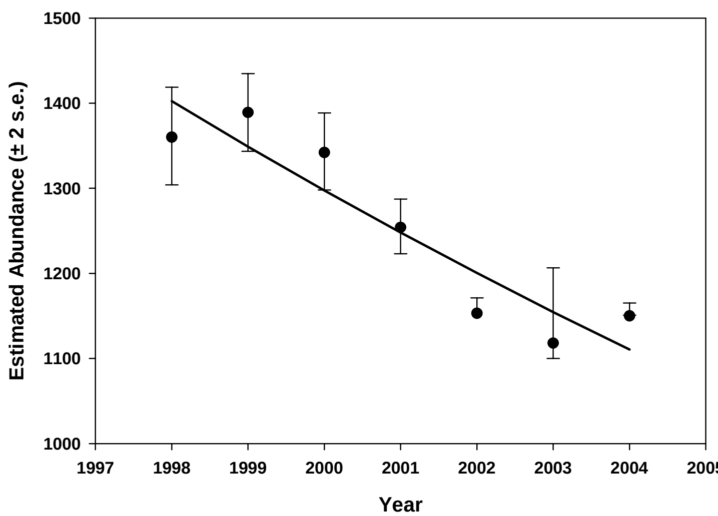


Figure 1A) Previous trend analysis using a broken-line regression of log-non-pup beach counts (index of abundance) on year (from Carrette et al. 2005 SAR). B) Trend in abundance of monk seals at the six main Northwestern Hawaiian Islands subpopulations, based on a combination of total enumeration and capture–recapture estimates. Error bars indicate ±2 s.e. (from variances of capture-recapture estimates). Fitted log-linear regression line is shown.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

~~Using mean beach counts as a long-term index of total abundance, the current net productivity rate for this species is -0.019 yr⁻¹ (see above).~~ Trends in abundance vary considerably among the six main subpopulations. Mean non-pup beach counts are used as a long-term index of abundance for years when data are insufficient to estimate total abundance as described above). Beach counts at French Frigate Shoals declined 70% ~~since the mid-1980's (Fig. 1) was largely due to a severe decline at French Frigate Shoals, where non-pup beach counts decreased by 7%~~ from 1989-2004~~2003~~. Populations at Laysan and Lisianski Islands have remained relatively stable since approximately 1990, though the former has tended to increase slightly while the latter has decreased slowly.

Until recently, the three westernmost subpopulations, Kure, Midway and Pearl and Hermes Reef exhibited

~~[1] (B. Venables, s-news website, http://www.biostat.wustl.edu/mailinglists/s_news/200004/msg00212.html)~~

substantial growth. The subpopulation at Pearl and Hermes Reef increased after the mid-1970s. ~~The average growth rate from 1983-2000 was 6%yr^{-1} (loglinear regression of beach counts; R^2 = 0.84, P<0.001), and~~ Prior to 1999, beach count increases ~~growth rates~~ of up to 7%yr^{-1} were observed. This is the highest estimate of the maximum net productivity rate (R_{max}) observed for this species. ~~The subpopulation at Kure Atoll grew at an average rate of 5% yr^{-1} from 1983 to 2000 (loglinear regression of beach counts; R^2 = 0.85, p<0.001), due largely to decreased human disturbance and introduced females. However, since 2000, counts at Kure have declined coinciding with very low survival of the 2000-2002 cohorts from weaning to age 1 yr (15% to 22%). The subpopulation at Pearl and Hermes Reef increased after the mid-1970s. The average growth rate from 1983-2000 was 6%yr^{-1} (loglinear regression of beach counts; R^2 = 0.84, P<0.001), and prior to 1999, growth rates of up to 7%yr^{-1} were observed. This is the highest estimate of the maximum net productivity rate (R_{max}) observed for this species. Growth of this subpopulation has slowed recently and early survival has declined. Recovery of the small subpopulation at Midway Atoll appears to have slowed or stopped, also accompanied by relatively poor juvenile survival.~~ Since 2000, there has been a general decline in both abundance and juvenile survival at Pearl and Hermes, Midway and Kure. These demographic trends at the western end of the NWHI do not bode well for recovery, especially if recent low juvenile survival rates become chronic. While the MHI monk seal population may be on the rise (Baker and Johanos 2004), this remains unconfirmed and abundance appears to be too low to strongly influence current total stock trends.

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal (PBR) is designed to allow stocks to recover to, or remain above, the maximum net productivity level (MNPL) (Wade 1998). An underlying assumption in the application of the PBR equation is that marine mammal stocks exhibit certain dynamics. Specifically, it is assumed that a depleted ~~reduced~~ stock will naturally grow toward OSP (Optimum Sustainable Population), and that some surplus growth could be removed while still allowing recovery. The Hawaiian monk seal population is far below historical levels and has declined -3.8% yr^{-1} on average since 1998~~for the past decade~~. Thus, for unknown reasons, the stock's dynamics do not conform to the underlying model for calculating PBR such that PBR for the Hawaiian monk seal is undetermined.~~ The prescribed PBR calculation for this stock would be the minimum population size (1,2761,224) times one half the maximum net growth rate (½ of 7%) times a recovery factor of 0.1 (for an endangered species, Wade and Angliss 1997), which yields 4.54.3 monk seals per year. However, given the stock's current status and trend, the intended standard for determining PBR, i.e., recovery to MNPL, will not be achieved in the foreseeable future if a take of 4.54.3 seals a year is realized. It also appears unlikely that some non-zero level of removal below 4.54.3 animals could explain the lack of recovery of this stock. Given this unique set of circumstances,~~.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Human-related mortality has caused two major declines of the Hawaiian monk seal (Ragen 1999). In the 1800s, this species was decimated by sealers, crews of wrecked vessels, and guano and feather hunters (Dill and Bryan 1912; Wetmore 1925; Bailey 1952; Clapp and Woodward 1972). Following a period of at least partial recovery in the first half of the 20th century (Rice 1960), most subpopulations again declined. This second decline has not been fully explained, but trends at several sites appear to have been determined by human disturbance from military or U.S. Coast Guard activities (Ragen 1999; Kenyon 1972; Gerrodette and Gilmartin 1990). Currently, human activities in the NWHI are limited and human disturbance is relatively rare, but human-seal interactions have become an important issue in the MHI

Fishery Information

Fishery interactions with monk seals include: operations/gear conflict, seal consumption of discarded fish, and competition for prey. Entanglement of monk seals in derelict fishing gear, which is believed to originate outside the Hawaiian archipelago, is described in a separate section below. Since 1976, four known fishery-related monk seal deaths have included the following (NMFS unpubl. data): one seal drowned in a nearshore gillnet off Kauai (1976), another seal died from entanglement in the bridle rope of lobster trap near Necker Island (1986), another died from entanglement in an illegally set gill net off Oahu (1994), and one ingested a fish hook and likely drowned off Kauai (1995). A total of 36 ~~31~~ seals have been seen with embedded fish hooks from 1982 to 2004~~2003~~. The hooks were not always recovered and it was not possible to attribute each hooking event to a specific fishery. Among hooks that could be identified, sources included nearshore fisheries (esp. for *Caranx* sp. in the MHI) in State of Hawaii waters, bottomfish (handline) and longline fisheries in State and Federal waters (NMFS unpubl. data). A recent Biological Opinion summarized hookings and entanglements (NMFS 2002). The majority of these deaths and injuries have been seen incidental to land-based research or ~~other~~ reported by a variety of sources~~activities~~. Monk seal/fisheries interactions are not monitored in a manner such that the rate of fisheries-related injury or mortality can be assessed.

Several fisheries have potential to interact with Hawaiian monk seals. The NWHI lobster fishery was closed in 2000 due to uncertainty in the estimates of biomass, and the fishery remains closed to date.

In the past, interactions between the Hawaii-based domestic pelagic longline fishery and monk seals were documented (NMFS 2002). This fishery targets swordfish and tunas and does not compete with Hawaiian monk seals for prey. In October 1991, in response to 13 unusual seal wounds thought to have resulted from interactions with this fishery, NMFS established a Protected Species Zone extending 50 nautical miles around the NWHI and the corridors between the islands. Subsequently, no additional monk seal interactions with the longline fishery have been confirmed. Since 1991, there have been no observed or reported interactions of this fishery with monk seals.

The NWHI bottomfish handline fishery has been reported to interact with monk seals. This fishery occurred at low levels (< 50 t per year) until 1977, steadily increased to 460 metric tons in 1987, then dropped to 284 metric tons in 1988, and varied from 95-201 metric tons per year from 1989-2004~~2003~~ (Kawamoto 1995; Kawamoto, pers. comm.). The number of vessels peaked at 28 in 1987, ~~and~~ then varied from 9 to 17 in 1988 through 2003 (Kawamoto 1995; Kawamoto, pers. comm.). NMFS prepared a Section 7 Biological Opinion on the Fishery Management Plan for the bottomfish fishery, and concluded that the operation of this fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal nor would it likely destroy or adversely modify the monk seal's critical habitat (NMFS 2002). The Biological Opinion has no incidental take statement, though a MMPA Negligible Impact Determination is currently being prepared. An EIS for the bottomfish fishery management plan has also been ~~is also being~~ prepared. Nitta and Henderson (1993) documented reports of seals taking bottomfish and bait off fishing lines, and reports of seals attracted to discarded bycatch. A Federal observer program of the fishery began in the fourth quarter of 2003 ~~with 33% coverage~~ and no monk seal interactions have been observed to date~~during that quarter~~. Fishermen indicate that they have engaged in mitigating activity over the past several years, e.g., holding discards on-board, etc. (NMFS pers. comm.). The ecological effects of this fishery on monk seals (e.g., competition for prey or alteration of prey assemblages) are unknown. However, published studies on monk seal prey selection based upon scat/spew analysis and seal-mounted video rarely revealed evidence that monk seals fed on families of bottomfish which contain commercial species (many prey items recovered from scats and spews were identified only to the level of family; Goodman-Lowe 1998, Parrish et al. 2000). Fatty acid signature analysis is incomplete regarding the importance of commercial bottomfish in the monk seal diet, but this methodology continues to be pursued.

There have also been interactions between nearshore fisheries and monk seals in both the NWHI and the MHI. At least three seals were hooked at Kure Atoll before the U.S. Coast Guard vacated the atoll in 1993. In the MHI, one seal was found dead in a nearshore (non-recreational) gillnet in 1994 and a second seal was found dead in 1995 with a hook lodged in its esophagus. A total of 25~~20~~ seals have been observed with embedded hooks in the MHI during 1990-2004~~2003~~. Several incidents, including the dead hooked seal mentioned above, involved hooks used to catch ulua (jacks, *Caranx* spp.). Interactions in the MHI appear to be on the rise, as most hookings have occurred since 2000, and a seal was entangled in an actively fished nearshore gillnet off Oahu in 2002 (NMFS unpubl. data). The MHI bottomfish handline fishery also has potential to interact with monk seals, though no mortalities or serious injuries have been attributed to the fishery (Table 1).

Episodic interest in the harvest of precious coral in the NWHI represents a potential for future interactions with monk seals, as some seals forage at precious gold coral beds occurring over 500m in depth (Parrish et al. 2002). As a result, the Western Pacific Regional Fisheries Management Council recommended regulations to suspend or set to zero annual quotas for gold coral harvest at specific locations until data on impacts of such harvests become available.

Table 1. Summary of mortality and serious injury of Hawaiian monk seals due to fisheries and calculation of annual mortality rate. n/a indicates that sufficient data are not available.

Fishery Name	Year	Data Type	% Obs. coverage	Observed/Reported Mortality/Serious Injury	Estimated Mortality/ Serious Injury	Mean Takes (CV)
NWHI Lobster	~~1999~~	~~data collector[1]~~	~~83%~~	~~0~~	~~n/a~~	~~n/a~~
	2000-present	fishery closed				
Pelagic Longline[2]	~~1999~~	~~observer~~	~~3.3%~~	~~0~~	~~0~~	
	2000	observer	10.4%	0	0	
	2001	observer	22.5%	0	0	0 (0)
	2002	observer	24.6%	0	0	
	2003	observer	22.2%	0	0	
	2004	observer	24.6%	0	0	
NWHI Bottomfish	2000-2002	logbook	n/a	n/a	n/a	
	2003[3]	observer	33%	0	0	0 (0)
	2004	observer	18.3%	0	0	
MHI Bottomfish[4]	~~1999~~			0		
	2000			0		
	2001	n/a	none	0	n/a	n/a
	2002			0		
	2003			0		
	2004			0		
Nearshore[4]	~~1999~~			0		
	2000			1		
	2001	n/a	none	1	n/a	n/a
	2002			1		
	2003			2		
	2004					

Fishery Mortality Rate

Data are unavailable to fully assess interaction with some fisheries in Hawaii, therefore, total fishery mortality and serious injury cannot be considered to be insignificant and approaching a rate of zero. Monk seals also die from entanglement in fishing gear and other debris (likely originating from various countries), and NMFS along with partner agencies, is pursuing a program to mitigate entanglement (see below).

Direct fishery interactions with monk seals remain~~s~~ to be thoroughly evaluated and the information above represents only ~~observed~~ reported interactions. Without further study, an accurate estimate cannot be determined. Indirect interactions (i.e., involving competition for prey or consumption of discards) remain the topic of ongoing investigation.

Entanglement in Marine Debris

Hawaiian monk seals become entangled in fishing and other marine debris at rates higher than reported for other pinnipeds (Henderson 2001). A total of 253~~238~~ cases of seals entangled in fishing gear or other debris have been observed through 2003 (Henderson 2001; NMFS, unpubl. data), including seven documented mortalities resulting from entanglement in fisheries debris (Henderson 1990, 2001; NMFS, unpubl. data). The fishing gear fouling the reefs and beaches of the NWHI and entangling monk seals only rarely includes types used in Hawaiian fisheries. For example, trawl net and monofilament gillnet accounted for approximately 35% and 34% of the debris removed from reefs in the NWHI by weight, and trawl net alone accounted for 88% of the debris by frequency

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~~1 Fishery participants voluntarily hosted technicians to collect biological data, including protected species interactions. Because this was not conducted as an official observer program, mortality and serious injury rates were not estimated.~~

2 Until 2000, interactions with protected species were assessed using Federal logbooks and observers (4-5% coverage). Since 2001, the observer program has maintained over 20% coverage of the Hawaii-based longline fleet.

3 Observer coverage began in fourth quarter of 2003. Data for that quarter provided.

4 Data for MHI bottomfish and nearshore fisheries are based upon incidental observations (i.e., hooked seals). Following the method employed in a draft Negligible Impact Determination for the bottomfish fishery, all hookings not clearly attributable to either fishery with certainty were attributed to the bottomfish fishery, and hookings which resulted in injury of unknown severity were classified as serious.

(Donohue et al. 2001). Yet there are no commercial trawl fisheries in Hawaii.

The NMFS and partner agencies continue to mitigate impacts of marine debris on monk seals as well as turtles, coral reefs and other wildlife. Marine debris is removed from beaches and entangled seals during annual population assessment activities at the main reproductive sites. Since ~~During~~ 1996, annual ~~-2003~~ debris survey and removal efforts~~, over 470,000 kg of derelict net and other debris were removed from~~ in the NWHI coral reef habitat have been ongoing~~in the NWHI~~ (Donohue et al. 2000, Donohue et al. 2001~~; J. Asher, pers. comm~~).

Other Mortality

Since 1982, 23 seals died during rehabilitation efforts; additionally, two died in captivity, two died when captured for translocation, one was euthanized (an aggressive male known to cause mortality), three died during captive research and three died during field research (Baker and Johanos 2002).

In 1986, a weaned pup died at East Island, French Frigate Shoals, after becoming entangled in wire left when the U.S. Coast Guard abandoned the island three decades earlier. In 1991, a seal died after becoming trapped behind an eroding seawall on Tern Island, French Frigate Shoals. The only documented case of illegal killing of an Hawaiian monk seal occurred when a resident of Kauai killed an adult female in 1989.

Other sources of mortality that may impede recovery~~,~~ include single and multiple-male aggression (mobbing), shark predation, and disease/parasitism. Multiple-male aggression is thought to be related to an imbalance in adult sex ratios, with males outnumbering females. When several males attempt to mount and mate with an adult female or immature animal of either sex, injury or death of the attacked seal often results. This has primarily been identified as a problem at Laysan and Lisianski Islands, though it has also been documented at other subpopulations. In 1994, 22 adult males were removed from Laysan Island, and only five seals are thought to have died from multiple-male aggression at this site since their removal (1995-2004~~2003~~).

Attacks by single adult males have resulted in several monk seal mortalities. This was most notable at French Frigate Shoals in 1997, where at least 8 pups died as a result of adult male aggression. Many more pups were likely killed in the same way but the cause of their deaths could not be confirmed. Two males that killed pups in 1997 were translocated to Johnston Atoll, 870 km to the southwest. Subsequently, mounting injury to pups has decreased.

Shark-related injury and mortality incidents appeared to have increased in the late 1980s and early 1990s at French Frigate Shoals, but such mortality was probably not the primary cause of the decline at this site (Ragen 1993). However, shark predation has accounted for a significant portion of pup mortality in recent years. At French Frigate Shoals in 1999, 17 pups were observed injured by large sharks, and at least 3 were confirmed to have died from shark predation (Johanos and Baker 2001). As many as 22 pups of a total 92 born at French Frigate Shoals in 1999 were likely killed by sharks. After 1999, losses of pups to shark predation have been fewer, but this source of mortality remains a serious concern. Various mitigation efforts have been undertaken by NMFS in cooperation with the U. S. Fish and Wildlife Service (USFWS), which manages French Frigate Shoals as part of the Hawaiian Islands National Wildlife Refuge.

An Unusual Mortality Event (UME) contingency plan has recently been published for the monk seal (Yochem et al. 2004). While disease effects on monk seal demographic trends are uncertain, there is concern that diseases of livestock, feral animals, pets or humans could be transferred to naive monk seals in the main Hawaiian Islands and potentially spread to the core population in the NWHI. Recent diagnoses (R. Braun, pers. comm.) confirm that in 2003 and 2004, two deaths of free-ranging monk seals are attributable to diseases not previously found in the species: leptospirosis and toxoplasmosis. Leptospira bacteria are found in many of Hawaii's streams and estuaries and are associated with livestock and rodents. Cats, domestic and feral, are a common source of toxoplasma.

STATUS OF STOCK

In 1976, the Hawaiian monk seal was designated depleted under the Marine Mammal Protection Act of 1972 and as endangered under the Endangered Species Act of 1973. The species is well below its OSP and has not recovered from past declines. Therefore, the Hawaiian monk seal is characterized as a strategic stock.

Habitat Issues

Vessel groundings pose a continuing threat to monk seals and their habitat, through potential physical damage to reefs, oil spills, and release of debris into habitats. The substantial decline at French Frigate Shoals is likely related to lack of available prey and subsequent emaciation and starvation. Two leading hypotheses to explain the lack of prey are 1) the local population reached its carrying capacity in the 1970s and 1980s, diminishing its own food supply, and 2) carrying capacity was simultaneously reduced by changes in oceanographic conditions and a subsequent decline in productivity (Polovina et al. 1994; Craig and Ragen 1999). Similarly, recently observed poor juvenile survival rates suggest that prey availability may be limiting recovery of other NWHI subpopulations.

Goodman-Lowe (1998) provided information on prey selection using hard parts in scats and spewings. Information on at-sea movement and diving is available for seals at all six main subpopulations in the NWHI using satellite telemetry (Stewart 2004*a*,*b*; Stewart and Yochem 2004 *a*,*b*,*c*). Preliminary studies to describe the foraging habitat of monk seals in the MHI were begun in 2004.

Tern Island is the site of a USFWS refuge station, and is one of two sites in the NWHI accessible by aircraft. During World War II, the U.S. Navy enlarged the island to accommodate the runway, and a sheet-pile seawall was constructed to maintain the modified shape of the island. Degradation of the seawall created entrapment hazards for seals and other wildlife. Erosion of the sea wall also raised concerns about the potential release of toxic wastes into the ocean. The USFWS began construction on the Tern I. sea wall in 2004 to reduce entrapment hazards and protect the island shoreline. The USFWS considers this a high priority project to complete, and is pursuing funding to that end.

Another habitat issue involves loss of terrestrial habitat at French Frigate Shoals, where pupping and resting islets have shrunk or virtually disappeared (Antonelis et al. in press). ~~This is a subject of considerable interest and is under further investigation~~. Also, a paper evaluating the potential effect of global average sea level rise on NWHI terrestrial habitat has been submitted for publication (Baker, Littnan and Johnston, in review).

There are indications that monk seal abundance is increasing in the main Hawaiian Islands (Baker and Johanos 2004). Further, the excellent condition of pups weaned on these islands suggests that there may be ample prey resources available. If the monk seal population does expand in the MHI, it may bode well for the species' recovery and long-term persistence. In contrast, there are many challenges that may limit the potential for growth in this region. The human population in the MHI is approximately 1.2 million compared to fewer than 100 in the NWHI, so that the potential impact of disturbance in the MHI is great. As noted above, the hooking of monk seals by fishermen in the MHI is another source of injury and mortality. Finally, vessel traffic in the populated islands carries the potential for collision with seals and impacts from oil spills. Thus, issues surrounding monk seals in the main Hawaiian Islands will likely become an increasing focus for management and recovery of this species.

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NORTHERN FUR SEAL (*Callorhinus ursinus*): San Miguel Island Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Northern fur seals occur from southern California north to the Bering Sea and west to the Okhotsk Sea and Honshu Island, Japan (Fig. 1). During the breeding season, approximately 74% of the worldwide population is found on the Pribilof Islands in the southern Bering Sea, with the remaining animals spread throughout the North Pacific Ocean (Lander and Kajimura 1982). Of the seals in U.S. waters outside of the Pribilofs, approximately 1% of the population is found on Bogoslof Island in the southern Bering Sea and San Miguel Island off southern California (NMFS 1993). Northern fur seals may temporarily haul out on land at other sites in Alaska, British Columbia, and on islets along the coast of the continental United States, but generally this occurs outside of the breeding season (Fiscus 1983).

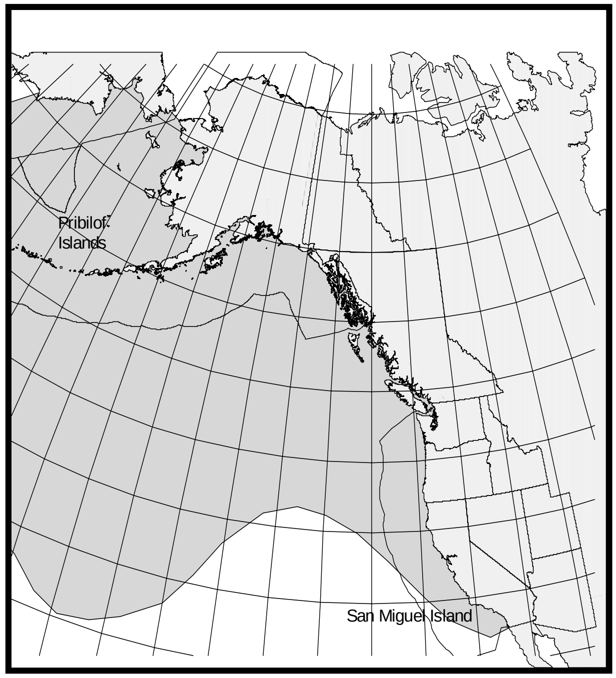

Figure 1. Approximate distribution of northern fur seals in the eastern North Pacific (shaded area).

Due to differing requirements during the annual reproductive season, adult males and females typically occur ashore at different, though overlapping, times. Adult males usually occur on shore during the 4-month period from May-August, though some may be present until November (well after giving up their territories). Adult females are found ashore for as long as six months (June-November). After their respective times ashore, seals of both genders spend the next 7-8 months at sea (Roppel 1984). Adult females and pups from the Pribilof Islands migrate through the Aleutian Islands into the North Pacific Ocean, often to Oregon and California offshore waters. Many pups may remain at sea for 22 months before returning to their rookery of birth. Adult males from the Pribilof Islands generally migrate only as far south as the Gulf of Alaska (Kajimura 1984). There is considerable interchange of individuals between rookeries.

The following information was considered in classifying stock structure based on the Dizon et al. (1992) phylogeographic approach: 1) ~~D~~distributional data: continuous geographic distribution during feeding, geographic separation during the breeding season, and high natal site fidelity (DeLong 1982); 2) ~~P~~population response data: substantial differences in population dynamics between the Pribilofs and San Miguel Island (DeLong 1982, DeLong and Antonelis 1991, NMFS 1993); 3) ~~P~~phenotypic data: unknown; and 4) ~~G~~genotypic data: unknown. Based on this information, two separate stocks of northern fur seals are recognized within U.S. waters: an Eastern Pacific stock and a San Miguel Island stock. The Eastern Pacific stock is reported separately in the Stock Assessment Reports for the Alaska Region.

POPULATION SIZE

The population estimate for the San Miguel Island stock of northern fur seals is calculated as the estimated number of pups at rookeries multiplied by an expansion factor. Based on research conducted on the Eastern Pacific stock of northern fur seals, Lander's (1981) ~~a~~ life table analysis was used ~~performed~~ to estimate the number of yearlings, two-year-olds, three-year-olds, and animals at least four years old ~~(Lander 1981)~~. The resulting population estimate was equal to the pup count multiplied by 4.475. The expansion factors are based on a sex and age distribution estimated after the commercial harvest of juvenile males was terminated in 1984. A more appropriate expansion factor for the San Miguel Island stock is 4.0, based on the known increased immigration of recruitment-age females (DeLong 1982) and mortality and possible emigration of adults associated with the El Niño Southern Oscillation events in 1982-1983 and 1997-1998 (R. DeLong, pers. comm.). A 1998 pup count resulted in ~~a total count of 627 pups, a 79.6%~~ an 80% decrease from the 1997 count ~~of 3,068~~ (~~Melin and DeLong 2000~~ Melin et al. 2005). In 1999, the population began to recover, and by ~~2002~~ 2005 the total pup count was ~~1,946~~ 2,356 (S. Melin, unpubl. data). Based on the ~~2002~~ 2005 count and the expansion factor, the most recent population estimate of the San Miguel Island stock is ~~7,784~~ 9,424 (~~1,946~~ 2,356 x 4.0) northern fur seals. Currently, a CV for the expansion factor is unavailable.

Minimum Population Estimate

The survey technique utilized for estimating the abundance of northern fur seals within the San Miguel Island stock is a direct count, with no associated coefficient of variation (CV), as sites are surveyed only once. Additional estimates of the overall population size (i.e., N_{BEST}) and associated CV are also unavailable. Therefore, N_{MIN} for this stock cannot be estimated by calculating the ~~log-normal~~ lower 20th percentile of the log-normal distribution of the population estimate. Rather, N_{MIN} is estimated as twice the maximum number of pups born in ~~2002~~ 2005 (to account for the pups and their mothers) plus the maximum number of adult and sub-adult males counted for the ~~2002~~ 2005 season, which results in an N_{MIN} of ~~4,190~~ 5,096 ((~~1,946~~ 2,356 x 2) + ~~298~~ 384). This method provides a very conservative estimate of the northern fur seal population at San Miguel Island.

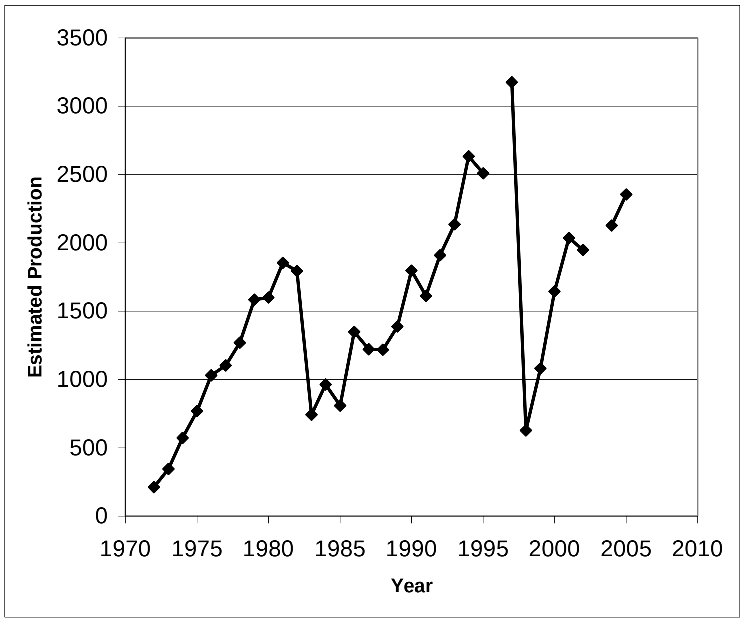

Figure 2. Northern fur seal estimated production ~~live pup counts~~ on San Miguel Island, 1972-2005 ~~2002~~.

Current Population Trend

The population of northern fur seals on San Miguel Island originated from the Pribilof Islands population during the late 1950s or early 1960s (DeLong 1982). The colony has increased steadily, since its discovery in 1968, except for severe declines in 1983 and 1998 associated with El Niño Southern Oscillation events in 1982-1983 and 1997-1998 (DeLong and Antonelis 1991, ~~Melin and DeLong 2000~~ Melin et al. 2005). El Niño events, which occur periodically along the California coast, impact population growth of northern fur seals at San Miguel Island and are an important regulatory mechanism for this population (DeLong and Antonelis 1991; Melin and DeLong 1994, 2000; Melin et al. 1996, 2005).

Specifically, live pup counts increased about 24% annually from 1972 through 1982, an increase due, in part, to immigration of females from the Bering Sea and the western North Pacific Ocean (DeLong 1982) ~~(Fig. 2)~~. The 1982-1983 El Niño event resulted in a 60.3% decline in the northern fur seal population at San Miguel Island (DeLong and Antonelis 1991). It took the population 7 years to recover from this decline, because adult female mortality occurred in addition to pup mortality (Melin and DeLong 1994). The 1992-1993 El Niño conditions resulted in reduced pup production in 1992, but the population recovered in 1993 and increased in 1994 (Melin et al. 1996).

From July 1997 through May 1998, the most severe El Niño event in recorded history affected California coastal waters (Lynn et al. 1998). In 1997, total fur seal pup production was ~~3,068 pups,~~ the highest recorded since the colony has been monitored (Fig. 2). However, it appears that up to 87% of the pups born in 1997 died before weaning, and total production in 1998 ~~was only 627 pups, a~~ declined ~~of 79.6%~~ 80% from 1997 (Melin et al. 2005 ~~Melin and DeLong 2000; S. Melin, unpubl. data~~). Although total production increased to ~~1,946~~ 2,356 in ~~2002~~ 2005 (S. Melin, unpubl. data), the population has not yet recovered. R~~r~~ecovery from the 1998 decline has been slowed by the adult female mortality which occurred in addition to the high pup mortality in 1997 and 1998 (~~Melin and DeLong 2000~~ Melin et al. 2005; S. Melin, unpubl. data).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

The northern fur seal population in the Pribilof Islands increased steadily during 1912-1924 after the commercial harvest no longer included pregnant females. During this period, the rate of population growth was approximately 8.6% (SE=1.47) per year (A. York, unpubl. data), the maximum recorded for this species. This growth rate is similar to and slightly higher than the 8.12% rate of increase (approximate SE=1.29) estimated by

Gerrodette et al. (1985). Given the extremely low density of the population in the early 1900s, the 8.6% rate of increase is considered a reliable estimate of R_{MAX}.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population estimate (~~4,190~~ 5,096) times one-half the observed maximum net growth rate (½ of 8.6%) times a recovery factor of 1.0 (for stocks of unknown status that are increasing in size~~,~~; Wade and Angliss 1997), resulting in a PBR of ~~180~~ 219 San Miguel Island northern fur seals per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Northern fur seals taken during the winter/spring along the west coast of the continental U.S. could be from the Pribilofs and, thus, belong to the Eastern Pacific stock. However, it is the intention of NMFS to consider any takes of northern fur seals by commercial fisheries in waters off California, Oregon, and Washington as being from the San Miguel Island stock. Information concerning the three observed fisheries that may have interacted with northern fur seals is listed in Table 1. There were no observer reports of northern fur seal mortalities in any observed fishery along the west coast of the continental U.S. ~~during the period from 1997-2001~~ in 2000-2004 (Table 1; Cameron and Forney ~~1999,~~ 2000; Carretta 2001, 2002; Carretta and Chivers 2003, 2004; Perez 2003; Carretta et al. 2005; J. Cusick, unpubl. data). The estimated mean mortality rate in observed fisheries is zero northern fur seals per year from this stock.

The Marine Mammal Authorization Permit (MMAP) fisher self-reports, required of vessel operators by the MMPA, are a~~A~~n additional source of information on the number of northern fur seals killed or injured incidental to commercial fishery operations.~~ is the self-reported fisheries information required of vessel operators by the MMPA. During the period between 1997 and 2001~~ Between 2000 and 2004, there were ~~two~~ no fisher self-reports of northern fur seal mortalities in ~~the~~ any fishery operating in waters off California, Oregon, or Washington ~~Washington/Oregon/California groundfish trawl (Pacific whiting) fishery, resulting in an annual estimated mortality of 0.4 fur seals from this stock~~. Although these reports are considered incomplete (see details in Appendix 1), they represent a minimum mortality. ~~However, because logbook records (fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994), these are considered to be minimum estimates. Logbook data are available for part of 1989-1994, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-1995 phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 in Angliss et al. 2001 for details).~~

Strandings of northern fur seals entangled in fishing gear or with injuries caused by interactions with gear are a final source of fishery-related mortality information. ~~One f~~Fishery-related strandings were ~~was~~ reported in 2001 (1 in California and 1 in Oregon) and 2003 (3 in Oregon) (J. Cordaro, pers. comm.; B. Norberg, pers. comm.) and, since they ~~it~~ could not be attributed to a particular fishery, they are ~~it is~~ listed in Table 1 as occurring in an unknown west coast fishery. Fishery-related strandings during ~~1997-2001~~ 2000-2004 resulted in an estimated annual mortality of ~~0.2~~ 1.0 animals from this stock. This estimate is considered a minimum because not all stranded animals are found, reported, or examined for cause of death (via necropsy by trained personnel).

Other Mortality

According to California Marine Mammal Stranding Network records, maintained by the NMFS Southwest Region, and Northwest Marine Mammal Stranding Network records, maintained by the NMFS Northwest Region, no ~~one~~ human-caused northern fur seal mortalities~~y (due to a head injury) was~~ were reported from ~~a~~ non-fisheries sources in 2000-2004 ~~1999, resulting in an estimated annual mortality of 0.2 northern fur seals in 1997-2001~~. This estimate is considered a minimum because not all stranded animals are found, reported, or examined for cause of death (via necropsy by trained personnel).

STATUS OF STOCK

The San Miguel Island northern fur seal stock is not considered to be “depleted” under the MMPA or listed as “threatened” or “endangered” under the Endangered Species Act. Based on currently available data, the estimated annual level of total human-caused mortality and serious injury (~~0.6 + 0.2 = 0.8~~ 1.0) does not exceed the PBR (~~180~~ 219). Therefore, the San Miguel Island stock of northern fur seals is not classified as a “strategic” stock. The minimum total fishery mortality and serious injury for this stock (~~0.6~~ 1.0) is not known to exceed 10% of the calculated PBR (~~18~~ 21.9) and, therefore, appears to be insignificant and approaching zero mortality and serious injury rate. The stock decreased ~~79.6%~~ 80% from 1997 to 1998, began to recover in 1999, and is currently at ~~63.4%~~ 74% of the 1997 level. The status of this stock relative to its Optimum Sustainable Population (OSP) level is unknown, unlike the Eastern Pacific northern fur seal stock which is formally listed as "depleted" under the MMPA.

Table 1. Summary of available information on the incidental mortality and injury of northern fur seals (San Miguel Island stock) in commercial fisheries that might take this species and calculation of the mean annual mortality rate; n/a indicates that data are not available. Mean annual takes are based on ~~1997-2001~~ 2000-2004 data unless noted otherwise.

Fishery name	Years	Data type	Percent observer coverage	Observed mortality	Estimated mortality	Mean annual takes (CV in parentheses)
CA/OR thresher shark/ swordfish drift gillnet	~~97~~ ~~98~~ 1999 2000 2001 2002 2003	~~obs data~~ observer	~~23.0%~~ ~~20.0%~~ 20.0% 22.9% 20.4% 22.1% 20.0%	~~0~~ ~~0~~ 0 0 0 0 0	~~0~~ ~~0~~ 0 0 0 0 0	0[1]
CA angel shark/halibut set gillnet	~~97~~ ~~98~~ 1999 2000 2001 2002 2003	~~obs data~~ observer	~~0%~~ ~~0%~~ 4% 1.8% 0% 0% 0%	~~0~~ ~~0~~ 0 0 0 0 0	~~0[1]~~ ~~0[1]~~ 0[~~1~~2] 0[~~1~~2] 0[~~1~~2] 0[2] 0[2]	0[1]
WA/OR/CA groundfish trawl (Pacific ~~whiting~~ hake at-sea processing component)	~~97~~ ~~98~~ ~~99~~ 2000 2001 2002 2003 2004	~~obs data~~ observer	~~65.7%~~ ~~77.3%~~ ~~68.6%~~ 80.6%[3] 96.2%[3] 100%[4] 100%[4] 100%[4]	~~0~~ ~~0~~ ~~0~~ 0 0 0 0 0	~~0~~ ~~0~~ ~~0~~ 0 0 0 0 0	0
WA/OR/CA groundfish trawl (Pacific ~~whiting~~ hake at-sea processing component)	~~97-01~~ 2000-2004	MMAP self-reports	n/a	~~2, 0, 0,~~ 0, 0, 0, 0, 0	n/a	0 ~~≥0.4 (n/a)~~
Unknown west coast fishery	~~97-01~~ 2000-2004	~~strand data~~ stranding	n/a	~~0, 0, 0, 0, 1~~ 0, 2, 0, 3, 0	n/a	~~≥0.2 (n/a)~~ ≥1.0 (n/a)
Minimum total annual takes						~~≥0.6 (n/a)~~ ≥1.0 (n/a)

[1]The 1999-2003 mortality estimates are included in the average.
[~~1~~2]The California set gillnets were not observed after 1994; mortality for 1999-2003 was extrapolated from effort estimates and previous entanglement rates, except for Monterey Bay, where the fishery was observed in 1999 and 2000.
[3]Percent observer coverage equals percent of observed catch; observers were present on 100% of the vessels.
[4]Percent observer coverage equals percent of vessels with observers.

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HARBOR PORPOISE (*Phocoena phocoena*): Oregon/Washington Coast Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the eastern North Pacific Ocean, ~~the~~ harbor porpoise are found in coastal and inland waters ~~ranges~~ from Point Barrow, along the Alaskan coast, and down the west coast of North America to Point Conception, California (Gaskin 1984). ~~Harbor porpoise primarily frequent coastal waters.~~ Harbor porpoise are known to occur year-round in the inland trans-boundary waters of Washington and British Columbia, Canada (Osborne et al. 1988), and along the Oregon/Washington coast (Barlow 1988, Barlow et al. 1988, Green et al. 1992). Aerial survey data from coastal Oregon and Washington, collected during all seasons, suggest~~s~~ that harbor porpoise distribution varies by depth (Green et al. 1992). Although distinct seasonal changes in abundance along the west coast have been noted, and attributed to possible shifts in distribution to deeper offshore waters during late winter (Dohl et al. 1983, Barlow 1988), seasonal movement patterns are not fully understood ~~harbor porpoise have also been conspicuously absent in offshore areas in late November (B. Taylor, pers. comm.) leaving a gap in the current understanding of their movements~~.

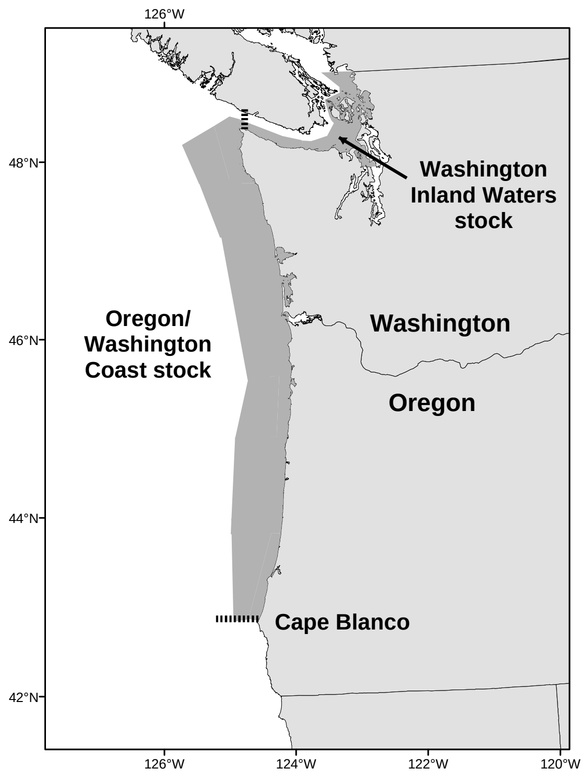

Figure 1. Stock boundaries (dashed lines) and a~~A~~pproximate distribution (shaded areas) of harbor porpoise along the coasts of Washington and northern Oregon. ~~in the U.S. Pacific Northwest (shaded area). Stock boundaries separating the stocks are shown.~~

Investigation of pollutant loads in harbor porpoise ranging from California to the Canadian border suggests restricted harbor porpoise movements (Calambokidis and Barlow 1991). Stock discreteness in the eastern North Pacific was analyzed using mitochondrial DNA from samples collected along the west coast (Rosel 1992) and is summarized in Osmek et al. (1994). Two distinct mtDNA groupings or clades exist. One clade is present in California, Washington, British Columbia, and Alaska (no samples were available from Oregon), while the other is found only in California and Washington. Although these two clades are not geographically distinct by latitude, the results may indicate a low mixing rate for harbor porpoise along the west coast of North America. ~~Investigation of pollutant loads in harbor porpoise ranging from California to the Canadian border also suggests restricted harbor porpoise movements (Calambokidis and Barlow 1991).~~ Further genetic testing of the same data ~~mentioned above~~, along with additional samples, found significant genetic differences for four of the six pair-wise comparisons between the four areas investigated: California, Washington, British Columbia, and Alaska (Rosel et al. 1995). These results demonstrate that harbor porpoise along the west coast of North America are not panmictic or migratory~~,~~ and that movement is sufficiently restricted ~~to evolve~~ that genetic differences have evolved. Recent preliminary genetic analyses of samples ranging from Monterey Bay, California, to Vancouver Island, British Columbia, indicate that there is small-scale subdivision within the U.S. portion of this range (Chivers et al. 2002). This is consistent with low movement suggested by genetic analysis of harbor porpoise specimens from the North Atlantic, where numerous stocks have been delineated with clinal differences over areas as small as the waters surrounding the British Isles.

Using the 1990-1991 aerial survey data of Calambokidis et al. (1993) for water depths <50 fathoms, Osmek et al. (1996) found significant differences in harbor porpoise mean densities ($z=5.9$, $p<0.01$) between the waters of coastal Oregon/Washington and inland Washington/southern British Columbia, Canada (i.e., Strait of Juan de Fuca/San Juan Islands). Although differences in density exist between coastal Oregon/Washington and inland

Washington waters, a specific stock boundary line cannot be identified based upon biological or genetic differences. However, harbor porpoise movements and rates of intermixing within the eastern North Pacific are restricted, and there has been a significant decline in harbor porpoise sightings within southern Puget Sound since the 1940s; therefore, following a risk averse management strategy, two stocks are recognized: the Oregon/Washington Coast stock (between Cape Blanco, OR, and Cape Flattery, WA) and the Washington Inland Waters stock (in waters east of Cape Flattery) (see Fig. 1). Recent genetic evidence suggests that the population of eastern North Pacific harbor porpoise is more finely structured than is currently recognized (Chivers et al. 2002). All relevant data (e.g., genetic samples, contaminant studies, and satellite tagging) will be reviewed to determine whether to adjust the stock boundaries for harbor porpoise in Oregon and Washington waters.

In their assessment of California harbor porpoise, Barlow and Hanan (1995) recommended two stocks be recognized in California, with the stock boundary at the Russian River. Based on recent genetic findings (Chivers et al. 2002), California coast stocks were re-evaluated and significant genetic differences were found among four identified sampling sites. Revised stock boundaries, based on these genetic data and density discontinuities identified from aerial surveys, resulted in six California/Oregon/Washington stocks where previously there had been four (Carretta et al. 2001): 1) the Washington Inland Waters stock, 2) the Oregon/Washington Coast stock, 3) the Northern California/Southern Oregon stock, 4) the San Francisco-Russian River stock, 5) the Monterey Bay stock, and 6) the Morro Bay stock. The stock boundaries for animals that occur in Washington/northern Oregon waters are shown in Figure 1. This report considers only the Oregon/Washington Coast stock. Stock assessment reports for ~~the~~ Washington Inland Waters, Northern California/Southern Oregon, San Francisco-Russian River, Monterey Bay, and Morro Bay harbor porpoise ~~stocks~~ also appear in this volume. Stock assessment reports for the t~~T~~hree harbor porpoise stocks ~~are also recognized~~ in the inland and coastal waters of Alaska, including 1) the Southeast Alaska stock, 2) the Gulf of Alaska stock, and 3) the Bering Sea stock~~s. The three Alaska harbor porpoise stocks~~, are reported separately in the Stock Assessment Reports for the Alaska Region. The harbor porpoise occurring in British Columbia have not been included in any of the U.S. MMPA stock assessment reports ~~from either the Alaska Region or Pacific Northwest (Oregon/Washington)~~.

POPULATION SIZE

In August and September ~~1997~~ 2002, an aerial survey of Oregon, Washington, and southern British Columbia coastal waters, from shore to 200 m depth, resulted in an ~~observed~~ uncorrected abundance estimate of ~~11,599~~ 11,036 (CV=~~0.115~~ 0.11) harbor porpoise in U.S. waters north of Cape Blanco, OR (~~Laake et al. 1998a~~ J. Laake, unpubl. data). Using a correction factor of 3.42 (1/g(0); g(0)=0.292, CV=0.366) (Laake et al. 1997a), to adjust for groups missed by aerial observers, the corrected estimate of abundance for harbor porpoise in coastal Oregon (north of Cape Blanco) and Washington waters is ~~39,586~~ 37,745 (CV=~~0.384~~ 0.38). ~~This estimate represents a substantial increase over the 1991 estimate of 26,175 (Osmek et al. 1996), even though it excludes the area south of Cape Blanco, due to: 1) the larger sampling region in the 1997 survey (out to water depths of 200 m vs. 91 m in 1991) and 2) a different estimate of g(0) (Laake et al. 1998a).~~

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for this stock is calculated as the lower 20th percentile of the log-normal distribution ~~using Equation 1 from the PBR Guidelines~~ (Wade and Angliss 1997)~~: N_{MIN} = N/exp(0.842*[ln(1+[CV(N)]^2)]^{½}). Using~~ of the 2002 population estimate ~~(N)~~ of ~~39,586~~ 37,745, ~~and its associated CV(N) of 0.384, N_{MIN} for the Oregon/Washington Coast stock of harbor porpoise~~ which is ~~28,967~~ 27,705 harbor porpoise.

Current Population Trend

There are no reliable data on population trends of harbor porpoise for coastal Oregon, Washington, or British Columbia waters, however, the uncorrected estimates of abundance for the Oregon/Washington Coast stock in 1997 (11,599) and 2002 (11,036) were not significantly different (Z=-.31,P=0.76) (Laake et al. 1998a; J. Laake, unpubl. data).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is currently not available for harbor porpoise. Therefore, until additional data become available, it is recommended that the cetacean maximum theoretical net productivity rate (R_{MAX}) of 4% (Wade and Angliss 1997) be employed for the Oregon/Washington Coast harbor porpoise stock.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (~~28,967~~ 27,705) times one-half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.5 (for a stock of unknown status, Wade and Angliss 1997), resulting in a PBR of ~~290~~ 277 harbor porpoise per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Within the EEZ boundaries of coastal Oregon and Washington, human-caused (fishery) mortalities of harbor porpoise are presently known to occur only in the northern Washington marine set gillnet fishery. During 1992-1993, the ~~WA/OR~~ Washington/Oregon Lower Columbia River, ~~WA~~ Washington Grays Harbor, and ~~WA~~ Washington Willapa Bay drift gillnet fisheries were monitored at observer coverages of approximately 4% and 2%, respectively. There were no observed harbor porpoise mortalities in these fisheries.

~~NMFS observers monitored the northern Washington marine set gillnet fishery in 1997, 1998, and 2000. There was no observer coverage in 1999 or 2001; the total fishing effort was 4 and 46 net days, respectively, in those years and occurred only in inland waters (Gearin et al. 1994, 2000; P. Gearin, unpubl. data). For the entire area fished (coastal + inland waters), observer coverage ranged from approximately 40 to 98% during observed years.~~ Fishing effort in the northern Washington marine set gillnet fishery (areas 4, 4A, 4B, and 5) is conducted within the range of both harbor porpoise stocks (Oregon/Washington Coast and Washington Inland Waters ~~stocks~~) occurring in Washington State waters. Some movement of harbor porpoise between Washington's coastal and inland waters is likely, but it is currently not possible to quantify the extent of such movements. For the purposes of this stock assessment report, the animals taken in ~~the inland portion of the fishery are assumed to have belonged to the Washington Inland Waters stock and the animals taken in the coastal portion of the fishery~~ waters south and west of Cape Flattery, WA (areas 4 and 4A), are assumed to have belonged to the Oregon/Washington Coast stock,~~. Some movement of harbor porpoise between Washington's coastal and inland waters is likely, but it is currently not possible to quantify the extent of such movements. Accordingly,~~ and Table 1 includes data only from that portion of the ~~northern Washington marine set gillnet~~ fishery.~~ occurring within the range of the Oregon/Washington Coast stock (those waters south and west of Cape Flattery, WA, and north of Cape Blanco, OR), where observer coverage was 100% in 1997 and 2000.~~ NMFS observers monitored 100% of the 50 net days (1 net day equals a 100-fathom length net set for 24 hours) of fishing effort in coastal waters in 2000 and observed three harbor porpoise takes;~~.~~ ~~N~~no fishing effort occurred in the coastal portion of the fishery in ~~1998,~~ 1999~~,~~ or 2001-2003 (Gearin, et al. 1994, 2000; P. Gearin, unpubl. data). The mean estimated mortality for this fishery in 1999-2003 is ~~3.2 (CV=0.79)~~ 0.6 (CV=1.0) harbor porpoise per year from this stock.

Table 1. Summary of incidental mortality of harbor porpoise (Oregon/Washington Coast stock) in commercial and tribal fisheries and calculation of the mean annual mortality rate; n/a indicates that data are not available. Mean annual takes are based on ~~1997-2001~~ 2000-2004 data unless noted otherwise.

Fishery name	Years	Data type	Percent observer coverage	Observed mortality	Estimated mortality	Mean annual takes (CV in parentheses)
Northern WA marine set gillnet (tribal fishery in coastal waters: areas 4 and 4A)	~~97~~ ~~98~~ 1999 2000 2001 2002 2003	~~obs data~~ observer	~~100%~~ ~~no fishery~~ no fishery 100% no fishery no fishery no fishery	~~13~~ ~~0~~ 0 3 0 0 0	~~13~~ ~~0~~ 0 3 0 0 0	~~3.2 (0.79)~~ 0.6 (1.0)[1]
Estimated total annual takes						~~3.2 (0.79)~~ 0.6 (1.0)

[1]The 1999-2003 mortality estimates are included in the average.

In 1995-1997, data were collected for the coastal portions (areas 4 and 4A) of the northern Washington marine set gillnet fishery ~~were collected~~ as part of an experiment, conducted in cooperation with the Makah Tribe, designed to explore the merits of using acoustic alarms to reduce bycatch of harbor porpoise in salmon gillnets.

Results in 1995-1996 indicated that the nets equipped with acoustic alarms had significantly lower entanglement rates, as only 2 of the 49 mortalities occurred in alarmed nets (Gearin et al. 1996, 2000; Laake et al. 1997b). In 1997, 96% of the sets were equipped with acoustic alarms and 13 mortalities were observed (Gearin et al. 2000; P. Gearin, unpubl. data). Harbor porpoise were displaced by an acoustic buffer around the alarmed nets, but it is unclear whether the porpoise ~~were repelled by the alarms~~ or ~~whether it was~~ their prey ~~that~~ were repelled by the alarms (Kraus et al. 1997, Laake et al. 1998b). However, the acoustic alarms did not appear to affect the target catch (chinook salmon and sturgeon) in the fishery (Gearin et al. 2000). In 2000, 84% of the sets (42 of 50 net days) in coastal waters were equipped with acoustic alarms and all three of the observed mortalities occurred in nets without alarms.

The Marine Mammal Authorization Permit (MMAP) fisher self-reports, required of vessel operators by the MMPA, are a~~A~~n additional source of information on the number of harbor porpoise killed or injured incidental to commercial fishery operations.~~ is the self-reported fisheries information required of vessel operators by the MMPA. During the period between 1997 and 2001~~ Between 2000 and 2004, there were no fisher self-reports of harbor porpoise mortalities from any fisheries operating within the range of the Oregon/Washington Coast stock. Although these reports are considered incomplete (see details in Appendix 1), they represent a minimum mortality. ~~However, because logbook records (fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994), these are considered to be minimum estimates. Logbook data are available for part of 1989-1994, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-1995 phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 in Angliss et al. 2001 for details).~~

There have been no fishery-related strandings of harbor porpoise from this stock dating back to at least 1990 (B. Norberg, pers. comm.).

Other Mortality

According to Northwest Marine Mammal Stranding Network records, maintained by the NMFS Northwest Region, no human-caused harbor porpoise mortalities or serious injuries were reported from non-fisheries sources in ~~1997-2001~~ 2000-2004.

STATUS OF STOCK

Harbor porpoise are not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. Based on the currently available data, the level of human-caused mortality and serious injury (~~3.2~~ 0.6) does not exceed the PBR (~~290~~ 277). Therefore, the Oregon/Washington Coast stock of harbor porpoise is not classified as "strategic." The total fishery mortality and serious injury for this stock (~~3.2~~ 0.6: based on observer data) is not known to exceed 10% of the calculated PBR (~~29~~ 27.7) and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate. The status of this stock relative to its Optimum Sustainable Population (OSP) level and population trends is unknown.

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HARBOR PORPOISE (*Phocoena phocoena*): Washington Inland Waters Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the eastern North Pacific Ocean, ~~the~~ harbor porpoise are found in coastal and inland waters ~~ranges~~ from Point Barrow, along the Alaskan coast, and down the west coast of North America to Point Conception, California (Gaskin 1984). ~~Harbor porpoise primarily frequent coastal waters.~~ Harbor porpoise are known to occur year-round in the inland trans-boundary waters of Washington and British Columbia, Canada (Osborne et al. 1988), and along the Oregon/Washington coast (Barlow 1988, Barlow et al. 1988, Green et al. 1992). Aerial survey data from coastal Oregon and Washington, collected during all seasons, suggest~~s~~ that harbor porpoise distribution varies by depth (Green et al. 1992). Although distinct seasonal changes in abundance along the west coast have been noted, and attributed to possible shifts in distribution to deeper offshore waters during late winter (Dohl et al. 1983, Barlow 1988), seasonal movement patterns are not fully understood ~~harbor porpoise have also been conspicuously absent in offshore areas in late November (B. Taylor, pers. comm.) leaving a gap in the current understanding of their movements~~.

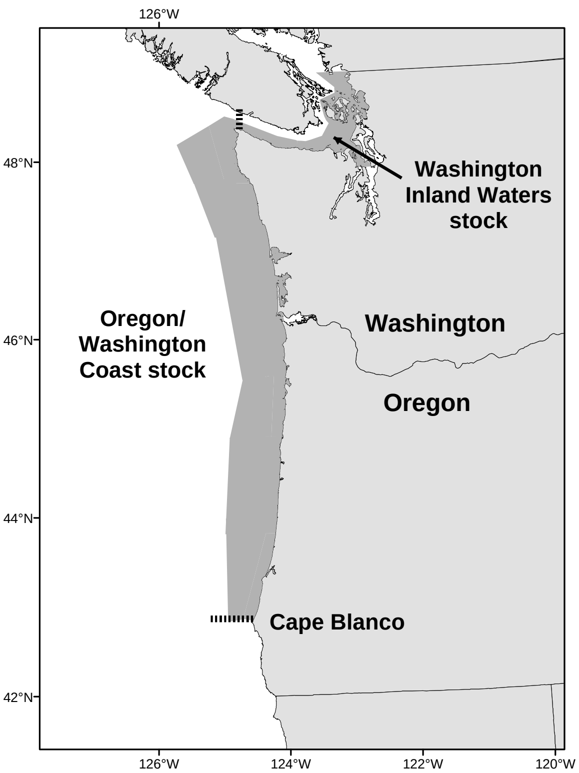

Figure 1. Stock boundaries (dashed lines) and a~~A~~pproximate distribution (shaded areas) of harbor porpoise along the coasts of Washington and northern Oregon. ~~in the U.S. Pacific Northwest (shaded area). Stock boundaries separating the stocks are shown.~~

Investigation of pollutant loads in harbor porpoise ranging from California to the Canadian border suggests restricted harbor porpoise movements (Calambokidis and Barlow 1991). Stock discreteness in the eastern North Pacific was analyzed using mitochondrial DNA from samples collected along the west coast (Rosel 1992) and is summarized in Osmek et al. (1994). Two distinct mtDNA groupings or clades exist. One clade is present in California, Washington, British Columbia, and Alaska (no samples were available from Oregon), while the other is found only in California and Washington. Although these two clades are not geographically distinct by latitude, the results may indicate a low mixing rate for harbor porpoise along the west coast of North America. ~~Investigation of pollutant loads in harbor porpoise ranging from California to the Canadian border also suggests restricted harbor porpoise movements (Calambokidis and Barlow 1991).~~ Further genetic testing of the same data ~~mentioned above~~, along with additional samples, found significant genetic differences for four of the six pair-wise comparisons between the four areas investigated: California, Washington, British Columbia, and Alaska (Rosel et al. 1995). These results demonstrate that harbor porpoise along the west coast of North America are not panmictic or migratory~~,~~ and that movement is sufficiently restricted ~~to evolve~~ that genetic differences have evolved. Recent preliminary genetic analyses of samples ranging from Monterey Bay, California, to Vancouver Island, British Columbia, indicate that there is small-scale subdivision within the U.S. portion of this range (Chivers et al. 2002). This is consistent with low movement suggested by genetic analysis of harbor porpoise specimens from the North Atlantic, where numerous stocks have been delineated with clinal differences over areas as small as the waters surrounding the British Isles.

Using the 1990-1991 aerial survey data of Calambokidis et al. (1993) for water depths <50 fathoms, Osmek et al. (1996) found significant differences in harbor porpoise mean densities ($z=5.9$, $p<0.01$) between the waters of coastal Oregon/Washington and inland Washington/southern British Columbia, Canada (i.e., Strait of Juan de Fuca/San Juan Islands). Although differences in density exist between coastal Oregon/Washington and inland

Washington waters, a specific stock boundary line cannot be identified based upon biological or genetic differences. However, harbor porpoise movements and rates of intermixing within the eastern North Pacific are restricted, and there has been a significant decline in harbor porpoise sightings within southern Puget Sound since the 1940s; therefore, following a risk averse management strategy, two stocks are recognized: the Oregon/Washington Coast stock (between Cape Blanco, OR, and Cape Flattery, WA) and the Washington Inland Waters stock (in waters east of Cape Flattery) (see Fig. 1). Recent genetic evidence suggests that the population of eastern North Pacific harbor porpoise is more finely structured than is currently recognized (Chivers et al. 2002). All relevant data (e.g., genetic samples, contaminant studies, and satellite tagging) will be reviewed to determine whether to adjust the stock boundaries for harbor porpoise in Oregon and Washington waters.

In their assessment of California harbor porpoise, Barlow and Hanan (1995) recommended two stocks be recognized in California, with the stock boundary at the Russian River. Based on recent genetic findings (Chivers et al. 2002), California coast stocks were re-evaluated and significant genetic differences were found among four identified sampling sites. Revised stock boundaries, based on these genetic data and density discontinuities identified from aerial surveys, resulted in six California/Oregon/Washington stocks where previously there had been four (Carretta et al. 2001): 1) the Washington Inland Waters stock, 2) the Oregon/Washington Coast stock, 3) the Northern California/Southern Oregon stock, 4) the San Francisco-Russian River stock, 5) the Monterey Bay stock, and 6) the Morro Bay stock. The stock boundaries for animals that occur in Washington/northern Oregon waters are shown in Figure 1. This report considers only the Washington Inland Waters stock. Stock assessment reports for ~~the~~ Oregon/Washington Coast, Northern California/Southern Oregon, San Francisco-Russian River, Monterey Bay, and Morro Bay harbor porpoise ~~stocks~~ also appear in this volume. Stock assessment reports for the t~~T~~hree harbor porpoise stocks ~~are also recognized~~ in the inland and coastal waters of Alaska, including 1) the Southeast Alaska stock, 2) the Gulf of Alaska stock, and 3) the Bering Sea stock~~s. The three Alaska harbor porpoise stocks~~, are reported separately in the Stock Assessment Reports for the Alaska Region. The harbor porpoise occurring in British Columbia have not been included in any of the U.S. MMPA stock assessment reports ~~from either the Alaska Region or Pacific Northwest (Oregon/Washington)~~.

POPULATION SIZE

Aerial surveys of the inside waters of Washington and southern British Columbia were conducted during August of ~~1996~~ 2002 and 2003 (~~Calambokidis et al. 1997~~ J. Laake, unpubl. data). These aerial surveys included the Strait of Juan de Fuca, San Juan Islands, Gulf Islands, and Strait of Georgia, which includes waters inhabited by the Washington Inland Waters stock of harbor porpoise as well as harbor porpoise from British Columbia~~, as well as the Washington Inland Waters stock~~. ~~A total of 2,117 km of survey effort was completed within U.S. waters, resulting in an uncorrected abundance of 1,025 (CV=0.151) harbor porpoise in the inside waters of Washington (Calambokidis et al. 1997, Laake et al. 1997a).~~ An average of the 2002 and 2003 estimates of abundance in U.S. waters results in an uncorrected abundance of 3,123 (CV= 0.10) harbor porpoise in Washington inland waters (J. Laake, unpubl. data). When corrected for availability and perception bias, using a correction factor of 3.42 (1/g(0); g(0)=0.292, CV=0.366) (Laake et al. 1997), the estimated abundance for the Washington Inland Waters stock of harbor porpoise is ~~3,509~~ 10,682 (CV=~~0.396~~ 0.38) animals (~~Laake et al. 1997a, 1997b~~ J. Laake, unpubl. data).

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for this stock is calculated as the lower 20th percentile of the log-normal distribution ~~using Equation 1 from the PBR Guidelines~~ (Wade and Angliss 1997)~~:~~ ~~$N_{MIN} = N/\exp(0.842*[\ln(1+[CV(N)]^2)]^{1/2})$.~~ ~~Using the population estimate (N)~~ of the average of the 2002 and 2003 population estimates (~~3,509~~ 10,682 ~~and its associated CV(N) of 0.396~~), ~~N_{MIN} for the Washington Inland Waters stock of harbor porpoise~~ which is ~~2,545~~ 7,841 harbor porpoise.

Current Population Trend

There are no reliable data on long-term population trends of harbor porpoise for most waters of Oregon, Washington, or British Columbia, however, the uncorrected estimate of abundance in Washington inland waters was significantly greater in 2002/2003 than in 1996 (3,123 vs. 1,025; Z=6.16, P<0.0001) (Calambokidis et al. 1997; J. Laake, unpubl. data). ~~For comparability to the 1996 survey, a re-analysis of the 1991 aerial survey data was conducted (Calambokidis et al. 1997). The abundance of harbor porpoise in the Washington Inland Waters stock in 1996 was not significantly different than in 1991 (Laake et al. 1997a).~~

A different situation exists in southern Puget Sound where harbor porpoise~~s~~ are ~~now~~ rarely observed, ~~a sharp~~ in contrast to 1942 when they were ~~considered~~ common in those waters (Scheffer and Slipp 1948). Although quantitative data for this area are lacking, marine mammal survey effort (Everitt et al. 1980), stranding records since the early 1970s (Osmek et al. 1995), and the results of harbor porpoise surveys of 1991 (Calambokidis et al. 1992) and 1994 (Osmek et al. 1995) indicate that harbor porpoise abundance has declined in southern Puget Sound. In 1994, a total of 769 km of vessel survey effort and 492 km of aerial survey effort conducted during favorable sighting conditions produced no sightings of harbor porpoise in southern Puget Sound. Reasons for the apparent decline are unknown, but it may be related to fishery interactions, pollutants, vessel traffic, or other factors~~activities that may affect harbor porpoise occurrence and distribution in this area~~ (Osmek et al. 1995). Recently, however, there have been confirmed sightings of harbor porpoise in central Puget Sound (R. DeLong, pers. comm.).~~ Research to identify trends in harbor porpoise abundance is also needed for the other areas within Washington inland waters.~~

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is not currently available for harbor porpoise. Hence, until additional data become available, it is recommended that the cetacean maximum theoretical net productivity rate (R_{MAX}) of 4% (Wade and Angliss 1997) be employed for the Washington Inland Waters harbor porpoise stock.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (~~2,545~~ 7,841) times one-half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.40 (for a stock of unknown status with a mortality rate CV$\geq$0.80, Wade and Angliss 1997), resulting in a PBR of ~~20~~ 63 harbor porpoise per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

~~NMFS observers monitored the northern Washington marine set gillnet fishery in 1997, 1998, and 2000; there was no observer coverage in 1999 or 2001 (Gearin et al. 1994, 2000; P. Gearin, unpubl. data). For the entire area fished (coastal + inland waters), observer coverage ranged from approximately 40 to 98% during observed years.~~ Fishing effort in the northern Washington marine set gillnet fishery (areas 4, 4A, 4B, and 5) is conducted within the range of both harbor porpoise stocks (Oregon/Washington Coast and Washington Inland Waters ~~stocks~~) occurring in Washington State waters. Some movement of harbor porpoise between Washington's coastal and inland waters is likely, but it is currently not possible to quantify the extent of such movements. For the purposes of this stock assessment report, the animals taken in ~~the inland portion of the fishery~~ waters east of Cape Flattery (areas 4B and 5) are assumed to have belonged to the Washington Inland Waters stock, and ~~the animals taken in the coastal portion of the fishery are assumed to have belonged to the Oregon/Washington Coast stock. Some movement of harbor porpoise between Washington's coastal and inland waters is likely, but it is currently not possible to quantify the extent of such movements. Accordingly,~~ Table 1 includes data only from that portion of the ~~northern Washington marine set gillnet~~ fishery. ~~occurring within the range of the Washington Inland Waters stock (those waters east of Cape Flattery), where observer coverage ranged from 40 to 80% between 1997 and 2001 and fishing effort ranged from 4-46 net days per year (1 net day equals a 100-fathom length net set for 24 hours).~~ NMFS observers monitored 58% of the 36 net days (1 net day equals a 100-fathom length net set for 24 hours) of fishing effort in inland waters in 2000. There was no observer program in 1999 or 2001-2003 in inland waters;~~ the total~~ fishing effort was 4, ~~and~~ 46, 4.5, and 7 net days (respectively) in those years, ~~it occurred only in inland waters,~~ and no harbor porpoise takes were reported (Gearin et al. 1994; 2000; P. Gearin, unpubl. data). No mortalities were reported ~~observed~~ in the inland portion of the fishery between ~~1997 and 2001~~ 1999 and 2003, thus, the mean estimated mortality for this fishery is zero harbor porpoise per year from this stock.

In 1993, as a pilot for future observer programs, NMFS in conjunction with the Washington Department of Fish and Wildlife (WDFW) monitored ~~all~~ non-treaty components (areas 7, 7A, 7B/7C, 8A/8D, 10/11, and 12/12A/12B) of the Washington Puget Sound Region salmon gillnet fishery (Pierce et al. 1994). Observer coverage was ~~1.3~~1.5% overall, ranging from 0.9% to 7.3% for the various components of the fishery. No harbor porpoise mortalities were reported (Table 1). Pierce et al. (1994) cautioned against extrapolating these mortalities to the entire Puget Sound fishery due to the low observer coverage and potential biases inherent in the data. The area 7/7A sockeye landings represented the majority of the non-treaty salmon landings in 1993, approximately 67%. Results of this pilot study were used to design the 1994 observer programs discussed below.

In 1994, NMFS in conjunction with WDFW conducted an observer program during the Puget Sound non-treaty chum salmon gillnet fishery (areas 10/11 and 12/12B). A total of 230 sets were observed during 54 boat trips, representing approximately 11% observer coverage of the 500 fishing boat trips comprising the total effort in this fishery, as estimated from fish ticket landings (Erstad et al. 1996). No harbor porpoise were reported within 100 m of observed gillnets. The Puget Sound treaty chum salmon gillnet fishery in Hood Canal (areas 12, 12B, and 12C) and Puget Sound treaty sockeye/chum gillnet fishery in the Strait of Juan de Fuca (areas 4B, 5, and 6C) were also monitored in 1994 (NWIFC 1995). No harbor porpoise mortalities were reported in the observer programs covering these treaty salmon gillnet fisheries, where observer coverage was estimated at 2.2% (based on % of total catch observed) and approximately 7.5% (based on % of observed trips to total landings), respectively.

Also in 1994, NMFS in conjunction with WDFW and the Tribes conducted an observer program to examine seabird and marine mammal interactions with the Puget Sound treaty and non-treaty sockeye salmon gillnet fishery (areas 7 and 7A). During this fishery, observers monitored 2,205 sets, representing approximately 7% of the estimated 33,086 sets occurring in the fishery (Pierce et al. 1996). There was one observed harbor porpoise mortality (one other was entangled and released alive with no indication that it was injured), resulting in a mortality rate of 0.00045 harbor porpoise per set, which extrapolates to 15 mortalities (CV=1.0) for the entire fishery.

In 1996, Washington Sea Grant Program conducted a test fishery in the non-treaty sockeye salmon gillnet fishery (area 7) to compare entanglement rates of seabirds and marine mammals and catch rates of salmon using three experimental gears and a control (monofilament mesh net). The experimental nets incorporated highly visible mesh in the upper quarter (50 mesh gear) or upper eighth (20 mesh gear) of the net or had low-frequency sound emitters attached to the corkline (Melvin et al. 1997). In 642 sets during 17 vessel trips, 2 harbor porpoise were killed in the 50 mesh gear.

Table 1. Summary of incidental mortality of harbor porpoise (Washington Inland Waters stock) due to commercial and tribal fisheries and calculation of the mean annual mortality rate; n/a indicates that data are not available. Mean annual takes are based on ~~1997-2001~~ 2000-2004 data unless noted otherwise.

Fishery name	Years	Data type	Percent observer coverage	Observed mortality	Estimated mortality	Mean annual takes (CV in parentheses)
Northern WA marine set gillnet (tribal fishery in inland waters: areas 4B and 5)	~~97~~ ~~98~~ 1999 2000 2001 2002 2003	~~obs data~~ observer	~~80%~~ ~~40%~~ 0% 58% 0% 0% 0%	~~0~~ ~~0~~ n/a 0 n/a n/a n/a	~~0~~ ~~0~~ n/a 0 n/a n/a n/a	0[1]
WA Puget Sound Region salmon set/drift gillnet (observer programs listed below covered segments of this fishery):	-	-	-	-	-	-
Puget Sound non-treaty salmon gillnet (all areas and species)	1993	~~obs data~~ observer	1.3%	0	0	see text
Puget Sound non-treaty chum salmon gillnet (areas 10/11 and 12/12B)	1994	~~obs data~~ observer	11%	0	0	0
Puget Sound treaty chum salmon gillnet (areas 12, 12B, and 12C)	1994	~~obs data~~ observer	2.2%	0	0	0
Puget Sound treaty chum and sockeye salmon gillnet (areas 4B, 5, and 6C)	1994	~~obs data~~ observer	7.5%	0	0	0
Puget Sound treaty and non-treaty sockeye salmon gillnet (areas 7 and 7A)	1994	~~obs data~~ observer	7%	1	15	15 (1.0)
Unknown Puget Sound fishery	~~97-01~~ 2000-2004	~~strand data~~ stranding		~~0, 0, 0,~~ 1, 0, 0, 0, 0		≥0.2 (n/a)

Fishery name	Years	Data type	Percent observer coverage	Observed mortality	Estimated mortality	Mean annual takes (CV in parentheses)
Minimum total annual takes						≥15.2 (1.0)

[1] ~~1997-98 and~~ Only the 2000 mortality estimate~~s are~~ is included in the average.

Combining the estimates from the 1994 observer programs (15) with the northern Washington marine set gillnet fishery (~~0~~zero) results in an estimated mean mortality rate in observed fisheries of 15 harbor porpoise per year from this stock. It should be noted that the 1994 observer programs did not sample all segments of the entire Washington Puget Sound Region salmon set/drift gillnet fishery and, further, the extrapolation of total kill did not include effort for the unobserved segments of this fishery. Therefore, 15 is an underestimate of the harbor porpoise mortality due to the entire fishery. Although the percentage of the overall Washington Puget Sound Region salmon set/drift gillnet fishery effort that was observed in 1994 was not quantified, the observer programs covered those segments of the fishery which had the highest salmon catches, the majority of vessel participation, and the highest likelihood of interaction with harbor porpoise (J. Scordino, pers. comm.). Since the Washington Inland Waters stock of harbor porpoise occurs primarily in the Strait of Juan de Fuca and the San Juan Islands, it is unlikely that many harbor porpoise are taken in other areas of the Washington Puget Sound Region salmon gillnet fishery (i.e., Hood Canal and southern Puget Sound). Harbor porpoise takes in the Washington Puget Sound Region salmon drift gillnet fishery are unlikely to have increased since the fishery was last observed in 1994, due to reductions in the number of participating vessels and available fishing time (see details in Appendix 1). Fishing effort and catch have declined throughout all salmon fisheries in the region due to management efforts to recover ESA-listed salmonids.

The Marine Mammal Authorization Permit (MMAP) fisher self-reports, required of vessel operators by the MMPA, are a~~A~~n additional source of information on the number of harbor porpoise killed or injured incidental to commercial fishery operations. ~~is the self-reported fisheries information required of vessel operators by the MMPA. During the period between 1994 and 2001~~ Between 2000 and 2004, there were no fisher self-reports of harbor porpoise mortalities from the Washington Puget Sound Region salmon set/drift gillnet fishery. Unlike the 1994 observer program data, the self-reported fisheries data cover the entire fishery. Although these reports are considered incomplete (see details in Appendix 1), they represent a minimum mortality. ~~However, because logbook records (fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994), these are considered to be minimum estimates of harbor porpoise mortality. Logbook data are available for part of 1989-1994, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-1995 phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 in Angliss et al. 2001 for details).~~

Strandings of harbor porpoise wrapped in fishing gear or with injuries caused by interactions with gear are a final source of fishery-related mortality information. One fishery-related stranding of a harbor porpoise occurred in 2000 in Bellingham Harbor (B. Norberg, pers. comm.). As the stranding could not be attributed to a particular fishery, it has been included in Table 1 as occurring in an unknown Puget Sound fishery. Fishery-related strandings during ~~1997-2001~~ 2000-2004 resulted in an estimated annual mortality of 0.2 harbor porpoise from this stock. This estimate is considered a minimum because not all stranded animals are found, reported, or examined for cause of death (via necropsy by trained personnel).

Although, commercial gillnet fisheries in Canadian waters are known to have taken harbor porpoise in the past (Barlow et al. 1994, Stacey et al. 1997), few data are available because the fisheries were not monitored. In 2001, the Department of Fisheries and Oceans, Canada, conducted a federal fisheries observer program and a survey of license holders to estimate the incidental mortality of harbor porpoise in selected salmon fisheries in southern British Columbia (Hall et al. 2002). Based on the observed bycatch of porpoise (2 harbor porpoise mortalities) in the 2001 fishing season, the estimated mortality for southern British Columbia in 2001 was 20 porpoise per 810 boat days fished or a total of 80 harbor porpoise. However, it is not known how many harbor porpoise from the Washington Inland Waters stock are currently taken in the waters of southern British Columbia.

The minimum estimated fishery mortality and serious injury for this stock is 15.2 harbor porpoise per year, based on observer program data (15) and stranding data (0.2) in U.S. waters.

Other Mortality

According to Northwest Marine Mammal Stranding Network records, maintained by the NMFS Northwest Region, one human-caused harbor porpoise mortality was reported from non-fisheries sources in ~~1997-2001~~ 2000-2004. An animal was struck by a ship in 2001, resulting in an estimated mortality of 0.2 harbor porpoise per year from this stock.

STATUS OF STOCK

Harbor porpoise are not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. Based on currently available data, the total level of human-caused mortality and serious injury (15.2 + 0.2 = 15.4) is not known to exceed the PBR (~~20~~ 63). Therefore, the Washington Inland Waters harbor porpoise stock is not classified as "strategic." The minimum total fishery mortality and serious injury for this stock (15.2) exceeds 10% of the calculated PBR (~~2.0~~ 6.3) and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of this stock relative to its Optimum Sustainable Population (OSP) level and population trends is unknown, although harbor porpoise sightings in southern Puget Sound have declined since the 1940s.

This stock is not recognized as "strategic," however, the ~~estimated take level is close to the PBR. The~~ mortality rate is based on observer data from a subset of the Washington Puget Sound Region salmon set/drift gillnet fishery that was last observed in 1994. Evaluation of the estimated take level is complicated by a lack of knowledge about the extent to which harbor porpoise from U.S. waters frequent the waters of British Columbia~~,~~ and are, therefore, subject to fishery-related mortality. Given that the estimated take level is from 1994, it is appropriate to consider whether the current take level is different. No new information is available about mortality per set, but 1) fishing effort has decreased in recent years and 2) ~~preliminary~~ analysis of data from ~~vessel (1999, 2002) and~~ aerial ~~(2002)~~ surveys in 2002 and 2003 indicates that abundance ~~and range have not declined~~ has increased since 1996.

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Revised ~~12/15/2003~~ 05/15/2006

BOTTLENOSE DOLPHIN (*Tursiops truncatus*): California Coastal Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Bottlenose dolphins are distributed worldwide in tropical and warm-temperate waters. In many regions, including California, separate coastal and offshore populations are known (Walker 1981; Ross and Cockcroft 1990; Van Waerebeek et al. 1990). Based on nuclear and mtDNA analyses, Lowther (2006) identified 5 haplotypes from 29 coastal animals and 25 haplotypes from 40 offshore animals from the U.S. west coast. There were no shared haplotypes between coastal and offshore animals and significant genetic differentiation between the two ecotypes was evident. California coastal bottlenose dolphins are found within about one kilometer of shore (Figure 1; Hansen, 1990; Carretta et al. 1998; Defran and Weller 1999) primarily from Point Conception south into Mexican waters, at least as far south as ~~Ensenada~~ San Quintin, Mexico. In southern California, animals are found within 500 m of the shoreline 99% of the time and within 250 m 90% of the time (Hanson and Defran 1993). Oceanographic events appear to influence the distribution of animals along the coasts of California and Baja California, Mexico, as indicated by a change in residency patterns along Southern California and a northward range extension into central California after the 1982-83 El Niño (Hansen and Defran 1990; Wells et al. 1990). Since the 1982-83 El Niño, which increased water temperatures off California, they have been consistently sighted in central California as far north as San Francisco. Photo-identification studies have documented north-south movements of coastal bottlenose dolphins (Hansen 1990; Defran et al. 1999), and monthly counts based on surveys between the U.S./Mexican border and Point Conception are variable (Carretta et al. 1998), indicating that animals are ~~probably~~ moving into and out of this area. There is little site fidelity of coastal bottlenose dolphins along the California coast; over 80% of the dolphins identified in Santa Barbara, Monterey, and Ensenada have also been identified off San Diego (Defran et al. 1999, Feinholz 1996, Defran, unpublished data). Although coastal bottlenose dolphins are not restricted to U.S. waters, cooperative management agreements with Mexico exist only for the tuna purse seine fishery and not for other fisheries which may take this species ~~(e.g. gillnet fisheries)~~. Therefore, the management stock includes only animals found within U.S. waters. For the Marine Mammal Protection Act (MMPA) stock assessment reports, bottlenose dolphins within the Pacific U.S. Exclusive Economic Zone are divided into three stocks: 1) California coastal stock (this report), 2) California, Oregon and Washington offshore stock, and 3) Hawaiian stock.

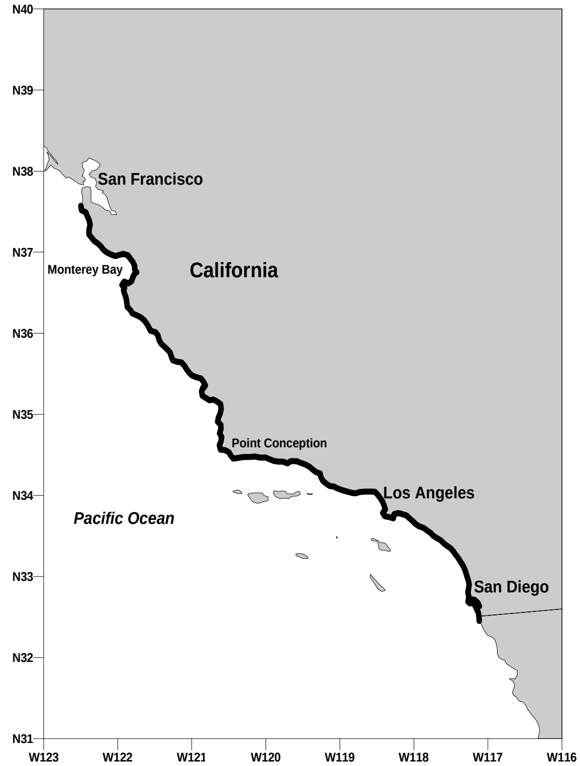

Figure 1. Approximate range (in bold) of California coastal bottlenose dolphins based on aerial surveys along the coast of California from 1990-2000. This population of bottlenose dolphins is found within about 1 km of shore.

P POPULATION SIZE

~~Photo-identification studies along the coasts of southern California and northern Mexico identified 404 unique individuals in this population between 1981 and 1989 based on dorsal fin characteristics, with an estimated 35% of animals lacking identifiable characters at any particular time (Defran and Weller 1999). This cannot be considered a minimum population estimate, however, because an unknown number of animals died during this period and rates of acquisition of dorsal fin characters are not known.~~ Based on photographic mark-recapture surveys conducted along the San Diego coast in 2004 and 2005, the most recent estimate of population size is 323 dolphins (CV = 0.13, 95% CI 259-430; Dudzik et al. 2005). This estimate does not reflect that approximately 35% of dolphins encountered lack identifiable dorsal fin marks (Defran and Weller 1999), although this fraction is highly variable (Dave Weller, pers. comm.). If 35% of all animals lack distinguishing marks, then the true population size would be closer to 450-500 animals. Comparing the most recent population size estimate with those obtained from 1987-89 (354 dolphins, 95% CI 330 – 390) and 1996-98 (356 dolphins, 95% CI 306 – 437; Dudzik 1999) suggests that the population size has been stable for approximately 20 years. Older estimates of population size for this stock range from ~~Mark-recapture estimates based on photo-identification studies in 1985-89 range from~~ 234 (95% CI 205-263) to 285 (95% CI 265-306) animals for the period 1985-89 ~~for the entire California-Mexico population~~ (Defran and Weller 1999). ~~A recent re-analysis of mark-recapture estimates from the 1980s resulted in revised abundance estimates of 289 (95% CI 230-298) for the period 1984-86 and 354 (95% CI 330-390) for 1987-89 (Dudzik 1999). The most recent photographic mark-recapture abundance estimate is 356 (95% CI 306 - 437) for the period 1996-98 (Dudzik 1999).~~ Because coastal bottlenose dolphins spend an unknown amount of time in Mexican waters, where they ~~are~~ may be subject to mortality in Mexican fisheries, an average abundance estimate for California only is the most appropriate for U.S. management of this stock. ~~Tandem aerial surveys were conducted in 1990-94 and 1999-2000 to estimate the abundance of coastal bottlenose dolphins throughout the southern and central California portion of their range and to correct for the fraction of animals missed by a single observer team. (Carretta et al. 1998, NMFS, SWFSC, unpublished data). Aerial survey correction factors have been improved using recent information on California coastal bottlenose dolphin swim speeds (Ward 1999). Using the same methods as Carretta et al. (1998), the weighted average abundance estimate for the 1999-2000 surveys is 206 (CV=0.12) coastal bottlenose dolphins (NMFS, SWFSC, unpublished data). This presently is the best estimate of the average number of coastal bottlenose dolphins in U.S. waters.~~

Minimum Population Estimate

~~The log-normal 20th percentile of the above average abundance estimate for U.S. waters based on the 1999-2000 surveys is 186 coastal bottlenose dolphins.~~ The minimum number of dolphins photographically identified during 2004-2005 field studies was 164, however, the discovery curve for new animals had not yet reached an asymptote during that study (Dudzik et al. 2005). The minimum population estimate for this stock is therefore taken as the lower 20th percentile of the log-normal distribution of abundance obtained from the photographic mark-recapture estimate (Dudzik et al. 2005), or approximately 290 dolphins.

Current Population Trend

Based on a comparison of mark-recapture abundance estimates for the periods 1987-89 ($\hat{N}$= 354), ~~and~~ 1996-98 ($\hat{N}$= 356), and 2004-05 ($\hat{N}$= 323), Dudzik ~~(1999)~~ et al. (2005) stated that the population size had remained stable over ~~an 11-year~~ this period.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No information on current or maximum net productivity rates is available for California coastal bottlenose dolphins.

POTENTIAL BIOLOGICAL REMOVAL

Not all California coastal bottlenose dolphins are present in U.S. waters at any moment, thus the PBR must be prorated to reflect that some animals are in Mexican waters. Coastal bottlenose dolphins are not randomly distributed along their 1000 km range, 18% of which occurs in Mexican waters. If bottlenose dolphins *were* randomly distributed temporally and spatially along their range, the PBR could be prorated by a factor of 0.82 to account for time spent outside of U.S. waters. As random distribution along their range is unlikely and detailed information on residence times in Mexican waters is unavailable, a minimum PBR correction factor of 0.82 is applied until more information is available. The potential biological removal (PBR) level for this stock is calculated as the minimum population size (~~186~~ 290) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a species of unknown status with no ~~known~~ estimated fishery mortality; Wade and Angliss 1997), resulting in a PBR of ~~1.9~~ 2.9 coastal bottlenose dolphins per year. Because this stock spends some of its time outside the U.S. EEZ, the PBR allocation for U.S. waters is 2.9 x 0.82 = 2.4 dolphins per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Due to its exclusive use of coastal habitats, this bottlenose dolphin population is susceptible to fishery-related mortality in coastal set net fisheries. A summary of information on fishery mortality and injury for this stock of bottlenose dolphin is shown in Table 1.

Table 1. Summary of available information on the incidental mortality and serious injury of bottlenose dolphins (California Coastal Stock) in commercial fisheries that might take this species.

Fishery Name	Data Type	Year(s)	Percent Observer Coverage	Observed Mortality	Estimated Annual Mortality	Mean Annual Takes (CV in parentheses)
CA angel shark/ halibut and other species large mesh (>3.5in) set gillnet fishery	observer data	~~1997~~ ~~1998~~ ~~1999~~ 2000 2001 2002 2003 2004	~~0 %~~ ~~0%~~ ~~4.0 %[1]~~ 1.8%[1] 0% 0% 0% 0%	0	0	0
Unknown fishery	Stranding	2000-2004	One bottlenose dolphin with a coastal stock haplotype stranded entangled in 3.5-inch mesh gillnet and another bottlenose dolphin of unknown haplotype stranded with its flukes cut off			≥0.4 (n/a)
Minimum total annual takes						~~0~~ ≥0.4 (n/a)

[1] ~~The CA set gillnets were not observed during 1997-98 and in 2001~~; ~~mortality was extrapolated from effort estimates and previous (1991-94) entanglement rates.~~ In 1999 and 2000, approximately 25% of the Monterey Bay portion of the set gillnet fishery was observed, representing <5% of the overall fishery. There has been no observer program for this fishery since 2000.

More detailed information on the set gillnet fishery is provided in Appendix 1. From 1991-94, no bottlenose dolphins were observed taken in this fishery with 10-15% observer coverage (Julian and Beeson 1998). The observer program was discontinued at the end of 1994, when coastal set gillnet fishing was banned within 3 nmi of the southern California coast. In central California, gillnets have been restricted to waters deeper than 30 fathoms (56m) since 1991 in all areas except between Point Sal and Point Arguello. In 2002, a ban on set gill and trammel nets inshore of 60 fathoms from Point Reyes to Point Arguello became effective. Because of these closures, the potential for mortality of coastal bottlenose dolphins in the California set gillnet fishery has been greatly reduced. Fisher self-report data and 36 stranding records for 1997-2001 do not include any evidence of fishery interactions for this stock. In 2003, a bottlenose dolphin stranded dead in San Diego, California, with 3.5-inch mesh gillnet wrapped around its tailstock (SWFSC stranding KXD0048). The animal was a 2.65 m immature female. Perforation of the animal's skin suggests the net was on the animal for some time. Mitochondrial DNA analysis showed that the haplotype for this animal matches that of known coastal stock animals (Lowther 2006; SWFSC, unpublished data). It is unknown which fishery is responsible for this mortality, but the location and type of gillnet found suggests either a set or drift gillnet targeting yellowtail, white seabass, or barracuda. In 2004, a bottlenose dolphin stranded near Newport Beach, California, with its flukes missing, suggesting interaction with an unknown entangling net fishery. The stock origin (coastal or offshore) of this animal is unknown. Coastal gillnet fisheries exist in Mexico and probably take animals from this population, but no details are available.

Other removals

Seven coastal bottlenose dolphins were collected during the late 1950s in the vicinity of San Diego (Norris and Prescott 1961). Twenty-seven additional bottlenose dolphins were captured off California between 1966 and 1982 (Walker 1975; Reeves and Leatherwood 1984), but based on the locations of capture activities, these animals probably were offshore bottlenose dolphins (Walker 1975). No additional captures of coastal bottlenose dolphins have been documented since 1982, and no live-capture permits are currently active for this species.

STATUS OF STOCK

The status of coastal bottlenose dolphins in California relative to OSP is not known, and there is no evidence of a trend in abundance. They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA. ~~Because no recent fishery takes have been documented, c~~Coastal bottlenose dolphins are not classified as a "strategic" stock under the MMPA~~, and the~~ because total annual fishery mortality and serious injury for this stock (≥0.4 per year) is less than the PBR (2.4). The total human-caused mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero.

Habitat Issues

Pollutant levels, especially DDT residues, found in Southern California coastal bottlenose dolphins have been found to be among the highest of any cetacean examined (O'Shea et al. 1980; Schafer et al. 1984). Although the effects of pollutants on cetaceans are not well understood, they may affect reproduction or make the animals more prone to other mortality factors (Britt and Howard 1983; O'Shea et al. 1999). This population of bottlenose dolphins may also be vulnerable to the effects of morbillivirus outbreaks, which were implicated in the 1987-88 mass mortality of bottlenose dolphins on the U.S. Atlantic coast (Lipscomb et al. 1994).

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Revised ~~05/15/2005~~ 05/15/2006

FALSE KILLER WHALE (*Pseudorca crassidens*): Hawaiian Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

False killer whales are found worldwide mainly in tropical and warm-temperate waters (Stacey et al. 1994). In the North Pacific, this species is well known from southern Japan, Hawaii, and the eastern tropical Pacific. Most knowledge about this species comes from outside Hawaiian waters (Stacey et al. 1994). There are six stranding records from Hawaiian waters (Nitta 1991; Maldini 2005). Two sightings of false killer whales were made during a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Figure 1; Barlow ~~2003~~ 2006). Smaller-scale surveys conducted around the Main Hawaiian Islands (Figure 2) show that false killer whales are also commonly encountered in nearshore waters (Baird et al. 2005, Mobley et al. 2000, Mobley 2001, 2002, 2003, 2004).

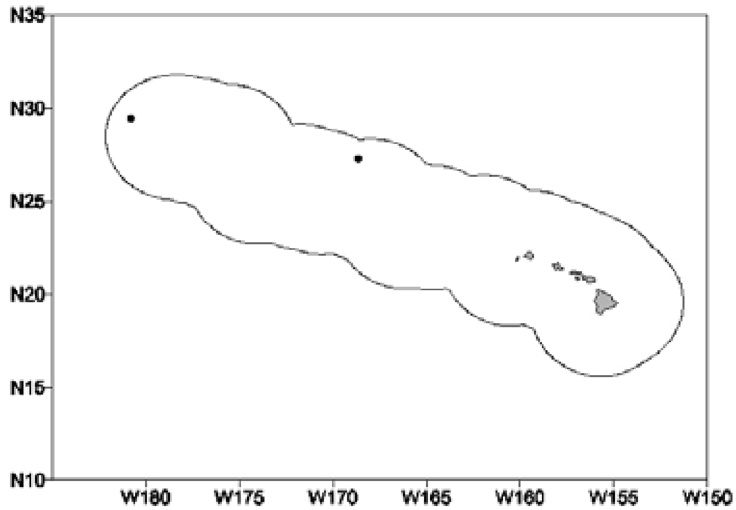

Figure 1. False killer whale sighting locations during the 2002 shipboard survey of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow ~~2003~~ 2006); see Appendix 2 for details on timing and location of survey effort). Outer line represents approximate boundary of survey area and U.S. EEZ.

Genetic analyses of tissue samples collected near the main Hawaiian Islands indicate that Hawaiian false killer whales are reproductively isolated from false killer whales found in the eastern tropical Pacific Ocean (S. Chivers, NMFS/SWFSC, unpublished data); however, the offshore range of this Hawaiian population is unknown. Since 2003, observers in the longline fishery have been collecting tissue samples of caught cetaceans for genetic analysis whenever possible. Two false killer whale samples, one collected outside the Hawaiian EEZ and one about 120 nmi southwest of Hawaii (See Figure 3) were determined to have eastern tropical Pacific (ETP) haplotypes. This suggests a boundary between the Hawaiian and ETP stocks somewhere within the Hawaiian EEZ. Further samples will be required to resolve this uncertainty.

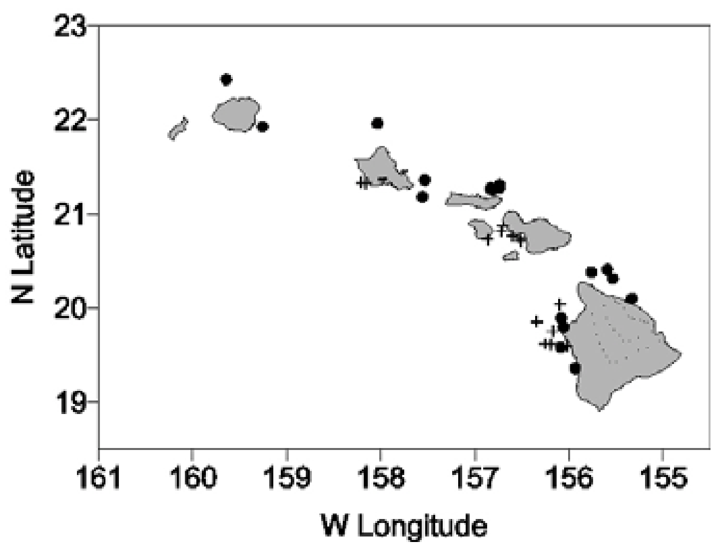

Figure 2. False killer whale sighting locations during 2000-2004 boat-based surveys (+) (Baird et al. 2005) and 1993-2003 aerial surveys (•) (Mobley et al. 2000, Mobley 2001, 2002, 2003, 2004) around the Main Hawaiian Islands. See Appendix 2 for details on timing and location of survey effort.

Fishery interactions with false killer whales demonstrate that this species also occurs in U.S. EEZ waters around Palmyra Atoll (Figure ~~2~~ 3), but it is not known whether these animals are part of the Hawaiian stock or whether they represent a separate stock of false killer whales. Based on patterns of movement and population structure observed in other island-associated cetaceans (Norris and Dohl 1980; Norris et al.1994; Baird et al. 2001, 2003; S. Chivers, pers. comm.), the animals around Palmyra Atoll may represent a separate stock. Unconfirmed sightings of false killer whales have also been reported near Johnston Atoll and require further investigation (NMFS/PIR, unpublished data). Efforts are currently underway to obtain additional tissue samples of false killer whales for further studies of population structure in the North Pacific Ocean. For the Marine Mammal Protection Act (MMPA) stock assessment reports, there is currently a single Pacific management stock including animals found within the U.S. EEZ of the Hawaiian Islands. Information on false killer whales around Palmyra Atoll will provisionally be included with this stock assessment report, recognizing that separate stock status may be warranted for these animals in the future. Estimates of abundance, potential biological removals, and status determinations will be presented separately for U.S. EEZ waters of the Hawaiian Islands and Palmyra Atoll.

POPULATION SIZE

Population estimates for this species have been made from shipboard surveys in Japan (Miyashita 1993) and the eastern tropical Pacific (Wade and Gerrodette 1993), but evidence suggests that false killer whales around Hawaii form a distinct population (S. Chivers, NMFS/SWFSC, unpublished data). As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 121 (CV=0.47) false killer whales was calculated from the combined survey data (Mobley et al. 2000). This study underestimated the total number of false killer whales within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed and estimates were uncorrected for the proportion of diving animals missed from the survey aircraft. Furthermore, the data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of ~~268~~ 236 (CV=~~1.08~~ 1.13) false killer whales (Barlow ~~2003~~ 2006). This is the best available abundance estimate for false killer whales within the Hawaiian Islands EEZ.

No abundance estimates are currently available for false killer whales in U.S. EEZ waters of Palmyra Atoll; however, density estimates for false killer whales in other Pacific regions can provide a range of likely abundance estimates in this unsurveyed region. Published estimates of false killer whale density (animals per km^2) in the Pacific are: 0.0001 (CV=~~1.08~~ 1.13) for the U.S. EEZ of the Hawaiian Islands (Barlow ~~2003~~ 2006); 0.0017 (CV=0.47) for nearshore waters surrounding the main Hawaiian Islands (Mobley et al. 2000), 0.0021 (CV=0.64) and 0.0016 (CV=0.31) for the eastern tropical Pacific Ocean (Wade and Gerrodette 1993; Ferguson and Barlow 2003), and 0.0033 (CV=0.56) for the eastern tropical Pacific Ocean west of 120°W and north of 5°N (Ferguson and Barlow 2003). Applying the lowest and highest of these density estimates to U.S. EEZ waters surrounding Palmyra Atoll (area size = ~~347,216~~ 352,821 km^2) yields a range of plausible abundance estimates of ~~42 - 1,160~~ 37-1,179 false killer whales.

Minimum Population Estimate

The log-normal 20th percentile of the 2002 abundance estimate for the Hawaiian Islands EEZ (Barlow ~~2003~~ 2006) is ~~128~~ 109 false killer whales. No minimum population estimate is currently available for waters surrounding Palmyra Atoll, but the false killer whale density estimates from other Pacific regions (Barlow ~~2003~~ 2006, Mobley et al. 2000, Wade and Gerrodette 1993, Ferguson and Barlow 2003; see above) can provide a range of likely values. The lognormal 20th percentiles of plausible abundance estimates for the Palmyra Atoll EEZ, based on the densities observed elsewhere, range from ~~20 - 746~~ 17-758 false killer whales.

Current Population Trend

No data are available on current population trend.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate for this species in Hawaiian waters.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the Hawaiian false killer whale stock is calculated as the minimum population size (~~128~~ 109) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of ~~0.45~~ 0.48 (for a stock of unknown status with a Hawaiian Islands EEZ mortality and serious injury rate CV between ~~0.60 and 0.80~~ 0.30 and 0.60; Wade and Angliss 1997), resulting in a PBR of ~~1.2~~ 1.0 false killer whales per year. No separate PBR can presently be calculated for false killer whales within the Palmyra Atoll EEZ, but based on the range of plausible minimum abundance estimates (~~20 - 746~~ 17-758), a recovery factor of 0.48 (for a species of unknown status with a fishery mortality and serious injury rate CV between 0.30 and 0.60

within the Palmyra Atoll EEZ; Wade and Angliss 1997), and the default growth rate (½ of 4%), the PBR would likely fall between 0.2 and ~~7.2~~ 7.3 false killer whales per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Information on fishery-related mortality of cetaceans in Hawaiian waters is limited, but the gear types used in Hawaiian fisheries are responsible for marine mammal mortality and serious injury in other fisheries throughout U.S. waters. Gillnets appear to capture marine mammals wherever they are used, and float lines from lobster traps and longlines can be expected to occasionally entangle whales (Perrin et al. 1994). In Hawaii, no mortality of false killer whales has been observed in inshore gillnets, but these fisheries are not observed or monitored.

Interactions with cetaceans have been reported for all Hawaiian pelagic fisheries, and false killer whales have been identified in fishermen's logs and NMFS observer records as taking catches from pelagic longlines (Nitta and Henderson 1993, NMFS/PIR unpublished data). They have also been observed feeding on mahi mahi, *Coryphaena hippurus*, and yellowfin tuna, *Thunnus albacares*, and ~~frequently~~ they have been reported to steal large fish (up to 70 pounds) ~~(Shallenberger 1981)~~ from the trolling lines of both commercial and recreational fishermen (Shallenberger 1981) ~~(S. Kaiser, pers. comm.)~~.

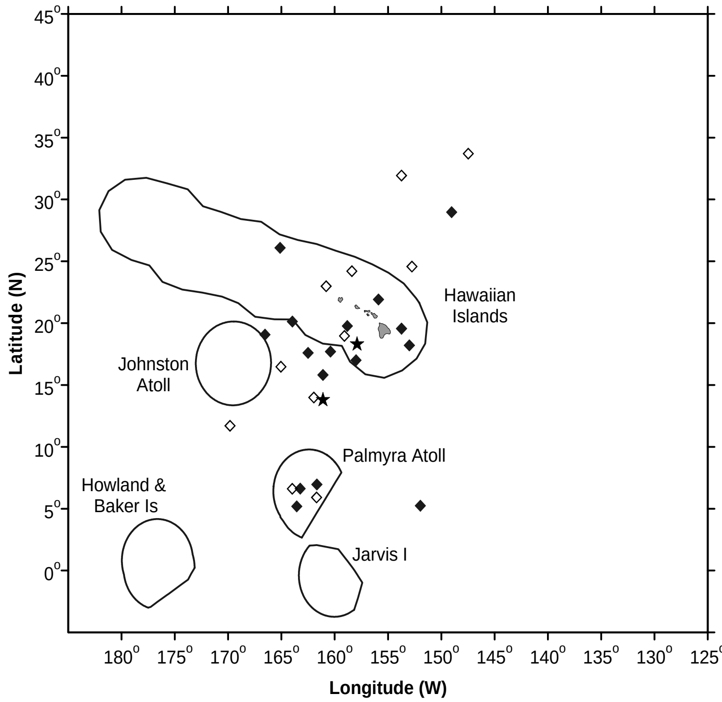

Figure 3. Locations of observed false killer whale takes (filled ~~diamonds~~ symbols) and possible takes of this species (open ~~diamonds~~ symbols) in the Hawaii-based longline fishery, 1994-2003. Stars are locations of genetic samples from fishery-caught false killer whales. Solid lines represent the U.S. EEZ. Set locations in this fishery are summarized in Appendix 1.

Between 1994 and ~~2003~~ 2004, 18 false killer whales were observed hooked in the Hawaii-based longline fishery, with approximately ~~4-25%~~ 4-26% of all effort observed (Table 1; Forney and Kobayashi 2005). Eleven additional unidentified cetaceans, which may have been false killer whales, were also taken in this fishery (Figure 3, Forney and Kobayashi 2005). During ~~the 15,859~~ 18,353 observed sets, the average

Table 1. Summary of available information on incidental mortality and serious injury of false killer whales (Hawaiian stock) in commercial fisheries, within and outside of U.S. EEZs (Forney and Kobayashi 2005). Mean annual takes are based on ~~1999-2003~~ 2000-2004 data unless otherwise indicated.

Fishery Name	Year	Data Type	Percent Observer Coverage	Observed and estimated mortality and serious injury of false killer whales, by EEZ region								
				Outside of U.S. EEZs			Hawaiian Islands EEZ			Palmyra Atoll EEZ		
				Obs.	Estimated (CV)	Mean Annual Takes (CV)	Obs.	Estimated (CV)	Mean Annual Takes (CV)	Obs.	Estimated (CV)	Mean Annual Takes (CV)
Hawaii-based longline fishery	~~1999~~	observer data	~~3.6%~~	~~0~~	~~0 (-)~~	~~4.2 (0.45)~~ 6.8 (0.36)	~~0~~	~~0 (-)~~	~~1.6 (0.71)~~ 4.2 (0.43)	~~0~~	~~0 (-)~~	1.8 ~~(0.59)~~ (0.53)
	2000		~~11.1~~11.0%	0	0 (-)		0	0 (-)		0	0 (-)	
	2001		23.0%	2	10 (0.71)		0	0 (-)		1	4 (1.00)	
	2002		24.8%	3	~~11~~ 12 (0.58)		0	~~0 (-)~~ 1[1] (0.99)		2	5 (0.71)	
	2003		21.9%	0	0 (-)		2	8 (~~0.71~~0.68)		0	0 (-)	
	2004		25.7%	3	12 (0.58)		3	12 (0.57)		0	0 (-)	
Minimum total annual takes within U.S. EEZ waters							~~3.4 (0.33)~~ 6.0 (0.35)					

[1] See Forney and Kobayashi (2005) for details on the derivation of this estimate.

interaction rate of false killer whales was ~~1.01~~ 0.98 false killer whales per 1,000 sets. One of the false killer whales was killed, and all others ~~All false killer whales~~ caught were considered seriously injured (Forney and Kobayashi 2005), based on an evaluation of the observer's description of the interaction and following established guidelines for assessing serious injury in marine mammals (Angliss and DeMaster 1998). Average 5-yr estimates of annual mortality and serious injury for ~~1999-2003~~ 2000-2004 are ~~4.2~~ 6.8 (CV = ~~0.45~~ 0.36) false killer whales outside of U.S. EEZs, ~~1.6~~ 4.2 (CV = ~~0.71~~ 0.43) within the Hawaiian Islands EEZ, and 1.8 (CV = ~~0.59~~ 0.53) within the EEZ of Palmyra Atoll (Table 1). Total estimated annual mortality and serious injury for all U.S. EEZs combined averaged ~~3.4~~ 6.0 (CV = ~~0.33~~ 0.35) between ~~1999~~ 2000 and ~~2003~~ 2004. Since 2001, the Hawaii-based longline fishery has undergone a series of regulatory changes, primarily to protect sea turtles (NMFS 2001). Potential impacts of these regulatory changes on the rate of false killer whale interactions are unknown.

Interaction rates between dolphins and the NWHI bottomfish fishery have been estimated based on studies conducted in 1990-1993, indicating that an average of 2.67 dolphin interactions, most likely involving bottlenose and rough-toothed dolphins, occurred for every 1000 fish brought on board (Kobayashi and Kawamoto 1995). Fishermen claim interactions with dolphins that steal bait and catch are increasing. It is not known whether these interactions result in serious injury or mortality of dolphins, nor whether false killer whales are involved.

STATUS OF STOCK

The status of false killer whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA. Because the rate of mortality and serious injury to false killer whales within the Hawaiian Islands EEZ in the Hawaii-based longline fishery (~~1.6~~ 4.2 animals per year) exceeds the PBR (1.2), this stock is considered a strategic stock under the 1994 amendments to the MMPA. The total fishery mortality and serious injury for Hawaiian false killer whales cannot be considered to be insignificant and approaching zero, because it exceeds the PBR. Although no estimates of abundance or PBR are currently available for false killer whales around Palmyra Atoll, the average rate of mortality and serious injury within the Palmyra Atoll EEZ (1.8 animals per year) falls within the range of likely PBRs (0.2 to ~~7.2~~ 7.3) for this region.

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Revised ~~07/15/2004~~ 05/15/2006

SHORT-FINNED PILOT WHALE (*Globicephala macrorhynchus*): Hawaiian Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Short-finned pilot whales are found in all oceans, primarily in tropical and warm-temperate waters. They are commonly observed around the main Hawaiian Islands and are also present around the Northwestern Hawaiian Islands (Shallenberger 1981; Barlow ~~2003~~ 2006). During a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands, 25 sightings of short-finned pilot whales were made (Figure 1; Barlow ~~2003~~ 2006). Fourteen strandings of short-finned pilot whales have been documented from the main Hawaiian Islands, including five mass strandings (Tomich 1986; Nitta 1991; Maldini 2003). Stock structure of short-finned pilot whales has not been adequately studied in the North Pacific, except in Japanese waters, where two stocks have been identified based on pigmentation patterns and differences in the shape of the heads of adult males (Kasuya et al. 1988). The pilot whales in Hawaiian waters are similar morphologically to the Japanese "southern form." Preliminary photo-identification work with pilot whales in Hawaii indicated a high degree of site fidelity around the main island of Hawaii (Shane and McSweeney 1990).

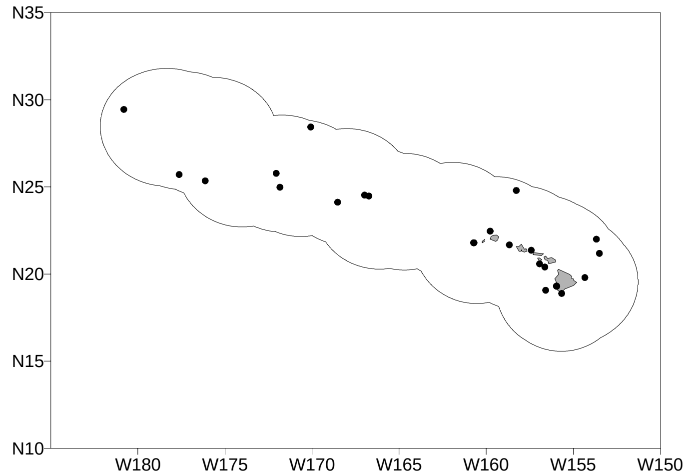

Figure 1. Short-finned pilot whale sighting locations during the 2002 shipboard survey of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow ~~2003~~ 2006); see Appendix 2 for details on timing and location of survey effort). Outer line represents approximate boundary of survey area and U.S. EEZ.

Genetic analyses of tissue samples collected near the main Hawaiian Islands indicate that Hawaiian short-finned pilot whales are reproductively isolated from short-finned pilot whales found in the eastern Pacific Ocean (S. Chivers, NMFS/SWFSC, unpublished data); however, the offshore range of this Hawaiian population is unknown. Fishery interactions with short-finned pilot whales demonstrate that this species also occurs in U.S. EEZ waters of Palmyra ~~Island~~ Atoll and Johnston Atoll (Figure 2), but it is not known whether these animals are part of the Hawaiian stock or whether they represent ~~a~~ separate stocks of short-finned pilot whales. Based on patterns of movement and population structure observed in other island-associated cetaceans (Norris and Dohl 1980; Norris et al.1994; Baird et al. 2001, 2003; S. Chivers, pers. comm.), it is possible that the animals around Palmyra ~~Island~~ Atoll and Johnston Atoll are ~~a~~ one or more separate stocks. Efforts are currently underway to obtain additional samples of short-finned pilot whales for further studies of population structure in the North Pacific Ocean. For the Marine Mammal Protection Act (MMPA) stock assessment reports, short-finned pilot whales within the Pacific U.S. EEZ are divided into two discrete, non-contiguous areas: 1) Hawaiian waters (this report), and 2) waters off California, Oregon and Washington. Information on short-finned pilot whales around Palmyra ~~Island~~ Atoll and Johnston Atoll will provisionally be included with this stock assessment report, recognizing that separate stock status may be warranted for these animals in the future. Estimates of abundance, potential biological removals, and status determinations will be presented separately for U.S. waters of the Hawaiian Islands, ~~and~~ Palmyra ~~Island~~ Atoll, and Johnston Atoll.

POPULATION SIZE

Estimates of short-finned pilot whale populations have been made off Japan (Miyashita 1993) and in the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether any of these animals are part of the same population that occurs around the Hawaiian Islands. As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 1,708 (CV=0.32) short-finned pilot whales was calculated from the combined survey data (Mobley et al. 2000). This study underestimated the total number of short-finned pilot whales within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. Furthermore, the data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 8,846 (CV=0.49) short-finned pilot whales (Barlow ~~2003~~ 2006). This is currently the best available abundance estimate for short-finned pilot whales within the Hawaiian Islands EEZ.

No abundance estimates are currently available for short-finned pilot whales in U.S. EEZ waters of Palmyra ~~Island~~ Atoll; however, density estimates for short-finned pilot whales in other Pacific regions can provide a range of likely abundance estimates in this unsurveyed region. Published estimates of short-finned pilot whale density (animals per km^2) in the Pacific are: ~~0.0036 (CV=0.49)~~ 0.0040 (CV=0.38) for the U.S. EEZ of the Hawaiian Islands (Barlow ~~2003~~ 2006); 0.0237 (CV=0.32) for nearshore waters surrounding the main Hawaiian Islands (Mobley et al. 2000), 0.0084 (CV=0.14) and 0.0040 (CV=0.23) for the eastern tropical Pacific Ocean (Wade and Gerrodette 1993; Ferguson and Barlow 2003), and 0.0025 (CV=0.29) for the eastern tropical Pacific Ocean west of 120°W and north of 5°N (Ferguson and Barlow 2003). Applying the lowest and highest of these density estimates to U.S. EEZ waters surrounding Palmyra ~~Island~~ Atoll (area size = ~~347,216~~ 352,821 km^2) yields a range of plausible abundance estimates of ~~877 - 8,229~~ 891-8,362 short-finned pilot whales. Similarly, there are no abundance estimates for short-finned pilot whales in U.S. EEZ waters of Johnston Atoll. Applying the lowest and highest of the above density estimates to U.S. EEZ waters surrounding Johnston Atoll (area size = 443,586 km2) yields a range of plausible abundance estimates of 1,121-10,513 short-finned pilot whales.

Minimum Population Estimate

The log-normal 20th percentile of the 2002 abundance estimate for the Hawaiian Islands EEZ (Barlow ~~2003~~ 2006) is ~~5,986~~ 6,511 short-finned pilot whales. No minimum population estimate is currently available for waters surrounding Palmyra ~~Island~~ Atoll or Johnston Atoll, but the short-finned pilot whale density estimates from other Pacific regions (Barlow ~~2003~~ 2006, Mobley et al. 2000, Wade and Gerrodette 1993, Ferguson and Barlow 2003; see above) can provide a range of likely values. The lognormal 20th percentiles of plausible abundance estimates for the Palmyra ~~Island~~ Atoll EEZ, based on the densities observed elsewhere, range from ~~690 - 6,327~~ 701 to 6,429 short-finned pilot whales. The lognormal 20th percentiles of plausible abundance estimates for the Johnston Atoll EEZ, based on the densities observed elsewhere, range from 882 to 8,083 short-finned pilot whales.

Current Population Trend

No data are available on current population trend.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the Hawaiian short-finned pilot whale stock is calculated as the minimum population size (~~5,986~~ 6,511) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a species of unknown status with ~~a~~ no known fishery mortality and serious injury within the U.S. EEZ of the Hawaiian Islands; Wade and Angliss 1997), resulting in a PBR of ~~60~~ 65 short-finned pilot whales per year. No separate PBR can presently be calculated for Palmyra ~~Island~~ Atoll waters, but based on the range of plausible minimum abundance estimates (~~690 - 6,327~~ 701-6,429), a recovery factor of ~~0.40~~ 0.50 (for a species of unknown status with ~~a~~ no known fishery mortality and serious injury ~~rate CV >0.80~~ within the Palmyra ~~Island~~ Atoll EEZ; Wade and Angliss 1997), and the default growth rate (½ of 4%), the PBR would likely fall between ~~5.5 and 51~~ 7.0 and 64 short-finned pilot whales per year. Similarly, based on the range of plausible minimum abundance estimates for Johnston Atoll (882-8,083), a recovery factor of 0.40 (for a species of unknown status with a fishery mortality and serious injury rate CV>0.80 within the Johnston Atoll EEZ; Wade and Angliss 1997), and the default growth rate (½ of 4%), the PBR would likely fall between 7.1 and 65 short-finned pilot whales per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Information on fishery-related mortality of cetaceans in Hawaiian waters is limited, but the gear types used in Hawaiian fisheries are responsible for marine mammal mortality and serious injury in other fisheries throughout U.S. waters. Gillnets appear to capture marine mammals wherever they are used, and float lines from lobster traps and longlines can be expected to occasionally entangle whales (Perrin et al. 1994).

Interactions with cetaceans have been reported for all Hawaiian pelagic fisheries (Nitta and Henderson 1993). Between 1994 and ~~2002~~ 2004, ~~five~~ six short-finned pilot whales were observed hooked in the Hawaii-based longline fishery with approximately ~~4-25%~~ 4-26% of all effort observed (Table 1; Forney and Kobayashi 2005 ~~2004~~). During the ~~905~~ observed ~~trips with 11,014~~ 18,353 sets, the average interaction rate of short-finned pilot whales was 0.33 short-finned pilot whales per 1000 sets~~ one animal per 181 fishing trips, or one animal per 2,203 sets~~. Two of the animals caught were dead upon gear retrieval, ~~and~~ two ~~additional animals~~ were considered seriously injured~~ (Forney 2004)~~, and one taken near Palmyra Atoll was considered not seriously injured (Forney and Kobayashi 2005), based on an evaluation of the observer's description of the interaction and following established guidelines for assessing serious injury in marine mammals (Angliss and DeMaster 1998). Average 5-yr estimates of annual mortality and serious injury for ~~1998-2002 are 4.2 (CV = 0.78)~~ 2000-2004 are 3.6 (CV = 0.69) short-finned pilot whales outside of the U.S. EEZs, and ~~0.8 (CV = 1.00)~~ 0.6 (CV = 1.00) within the U.S. EEZ of ~~Palmyra Island~~ Johnston Atoll (Table 1). No short-finned pilot whales were observed ~~taken~~ killed or seriously injured within the Hawaiian Islands EEZ or the Palmyra Atoll EEZ during ~~1998-2002~~ 2000-2004. ~~Six~~ Ten additional unidentified cetaceans, which may have been short-finned pilot whales, were also taken in this fishery. Two of these unidentified cetaceans were within the EEZ of Palmyra ~~Island~~ Atoll, and ~~four~~ three were in the EEZ of the Hawaiian Islands ~~international waters~~ (Figure 2, Forney and Kobayashi 2005 ~~2004~~). Since 2001, the Hawaii-based longline fishery has undergone a series of regulatory changes, primarily to protect sea turtles (NMFS 2001). Potential impacts of these regulatory changes on the rate of short-finned pilot whale interactions are unknown.

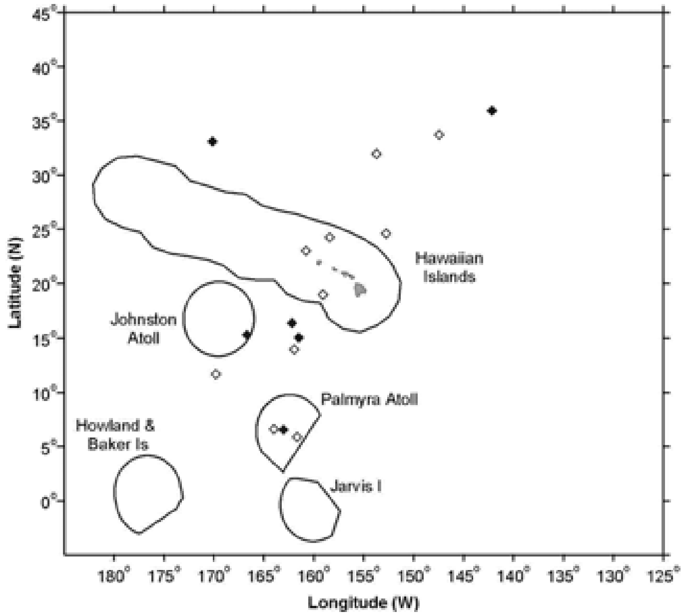

Figure 2. Locations of ~~observed sets (small dots),~~ short-finned pilot whale takes (filled diamonds) and possible takes of this species (open diamonds) in the Hawaii-based longline fishery, 1994-2002. Solid lines represent the U. S. EEZ. Set locations in this fishery are summarized in Appendix 1.

Table 1. Summary of available information on incidental mortality and serious injury of short-finned pilot whales (Hawaiian stock) in commercial fisheries, within and outside of the U.S. EEZs (Forney and Kobayashi 2005 ~~2004~~). Mean annual takes are based on ~~1998-2002~~ 2000-2004 data unless otherwise indicated.

Fishery Name	Year	Data Type	Percent Observer Coverage	Observed and estimated mortality and serious injury of short-finned pilot whales, by EEZ region								
				Outside of U.S. EEZs			Hawaiian Islands EEZ			~~Palmyra Island~~ Johnston Atoll EEZ		
				Obs.	Estimated (CV)	Mean Annual Takes (CV)	Obs.	Estimated (CV)	Mean Annual Takes (CV)	Obs.	Estimated (CV)	Mean Annual Takes (CV)
Hawaii-based longline fishery	~~1998~~	observer data	~~4.6%~~	~~0~~	~~0 (-)~~	~~4.2~~ ~~(0.78)~~ 3.6 (0.69)	~~0~~	~~0 (-)~~	0 (-)	~~0~~	~~0 (-)~~	~~0.8~~ 0.6 (1.00)
	~~1999~~		~~3.5%~~	~~0~~	~~0 (-)~~		~~0~~	~~0 (-)~~		~~0~~	~~0 (-)~~	
	2000		11.8%	2	~~17 (0.71)~~ 13 (0.88)		0	0 (-)		0	0 (-)	
	2001		22.7%	1	~~4~~ 5 (1.00)		0	0 (-)		~~1~~0	~~4 (1.00)~~ 0 (-)	
	2002		24.9%	0	0 (-)		0	0 (-)		0	0 (-)	
	2003		21.9%	0	0 (-)		0	0 (-)		0	0 (-)	
	2004		25.7%	0	0 (-)		0	0 (-)		1	3 (1.00)	
Minimum total annual takes within U.S. EEZ waters							~~0.8~~ 0.6 (1.00)					

Interaction rates between dolphins and the NWHI bottomfish fishery have been estimated based on studies conducted in 1990-1993, indicating that an average of 2.67 dolphin interactions, most likely involving bottlenose and rough-toothed dolphins, occurred for every 1000 fish brought on board (Kobayashi and Kawamoto 1995). Fishermen claim interactions with dolphins that steal bait and catch are increasing. It is not known whether these interactions result in serious injury or mortality of dolphins, nor whether short-finned pilot whales are involved.

STATUS OF STOCK

The status of short-finned pilot whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA. The Hawaiian stock of short-finned pilot whales is not considered strategic under the 1994 amendments to the MMPA, because the estimated rate of mortality and serious injury within the Hawaiian Islands EEZ is zero. However, ~~there is no systematic monitoring of gillnet fisheries that may take this species, and~~ the potential effect of mortality in the Hawaii-based fishery in international waters is not known. Although no estimates of abundance or PBR are currently available for short-finned pilot whales around ~~Palmyra Island~~ Johnston Atoll, the estimated average rate of mortality and serious injury of short-finned pilot whales within the EEZ of Johnston Atoll (0.6 animals per year) is below the range of likely PBRs (7.1 to 65) for this region. ~~the~~ There have been no serious injuries or mortalities of short-finned pilot whales ~~average rate of mortality and serious injury~~ within the Palmyra ~~Island~~ Atoll EEZ ~~(0.8 animals per year) falls below the range of likely PBRs (5.5 - 51) for this region~~. Insufficient information is available to determine whether the total fishery mortality and serious injury for short-finned pilot whales is insignificant and approaching zero mortality and serious injury rate.

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Revised ~~07/15/2004~~ 05/15/2006

BOTTLENOSE DOLPHIN (*Tursiops truncatus*): Hawaiian Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Bottlenose dolphins are widely distributed throughout the world in tropical and warm-temperate waters. The species is primarily coastal in much of its range, but there are populations in some offshore deepwater areas as well. Separate offshore and coastal forms have been identified along continental coasts in several areas (Ross and Cockcroft 1990; Van Waerebeek et al. 1990), and there is some evidence that similar onshore-offshore forms may exist in Hawaiian waters (Martien et al 2005; Baird et al, in prep).

Bottlenose dolphins are common throughout the Hawaiian Islands, from the island of Hawaii to Kure Atoll (Shallenberger 1981). Twelve strandings have been reported within the main Hawaiian Islands (Nitta 1991, Maldini 2003). Recent sighting locations based on a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands are shown in Figure 1. In the Hawaiian Islands, they are found in shallow inshore waters and deep water (Baird et al. 2003).

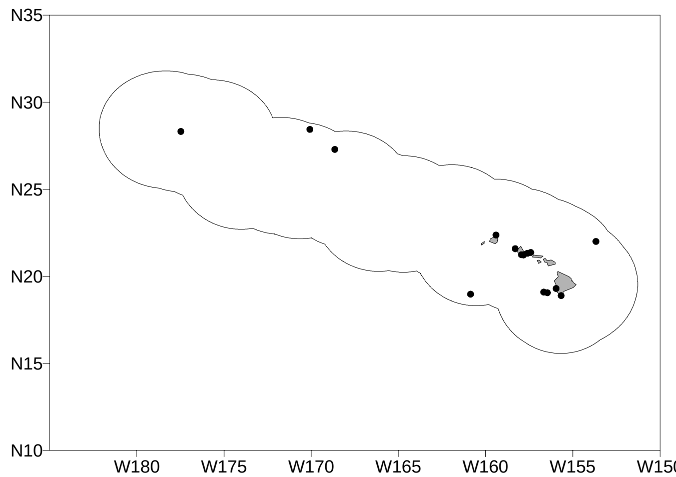

Figure 1. Bottlenose dolphin sighting locations during the 2002 shipboard cetacean survey of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow ~~2003~~ 2006; see Appendix 2 for details on timing and location of survey effort). Outer line represents approximate boundary of survey area and U.S. EEZ.

In their analysis of sightings of bottlenose dolphins in the eastern tropical Pacific (ETP), Scott and Chivers (1990) noted that there was a large hiatus between the westernmost sightings and the Hawaiian Islands. These data suggest that bottlenose dolphins in Hawaiian waters, belong to a separate stock from those in the ETP. Recent nearshore photo-identification studies off Oahu, Maui, Lanai, and Hawaii suggest limited movement of bottlenose dolphins between islands and into offshore waters (Baird et al. 2002; 2003), ~~but insufficient data are available to evaluate whether separate stocks may exist around the different islands and in offshore waters~~. Further analyses of these data (Baird et al., in prep), along with recent genetic analyses (Martien et al. 2005) suggest that up to five different stocks of bottlenose dolphins may exist in Hawaiian EEZ waters: 1) the “4-Island Region” (Moloka‘i, Lana‘i, Maui, Kaho‘olawe) 2) Oahu, 3) Kauai, Niihau & Hawaii, 4) Offshore Kauai & Niihau and 5) Offshore Oahu. However, the limited number of bottlenose dolphin groups sampled in these studies preclude any strong inference regarding stock structure within the Hawaiian EEZ at this time. Estimates of abundance and potential biological removals will be presented separately for the 4-Island Region, which currently is the only region with detailed information. For the Marine Mammal Protection Act (MMPA) stock assessment reports, bottlenose dolphins within the Pacific U.S. EEZ are divided into three stocks: 1) Hawaiian Stock (this report), 2) California, Oregon and Washington offshore stock, and 3) California coastal stock.

POPULATION SIZE

Population estimates have been made in Japanese waters (Miyashita 1993) and the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether these animals are part of the same population that occurs around the Hawaiian Islands. Photographic mark-recapture studies off Maui and Lanai estimated 134 (95% C.I. 107-180) bottlenose dolphins inhabiting that area (Baird et al. 2002). More recently, a minimum of 219 distinct bottlenose dolphins were identified around all the main Hawaiian Islands (Baird et al. 2003). As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 743 (CV=0.56) bottlenose dolphins was calculated from the combined survey data (Mobley et al. 2000). This abundance underestimates the total number of bottlenose dolphins within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. Furthermore, the data on which this estimate was based are now over 5 years old. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of ~~3,263~~ 3,215 (CV=~~0.60~~ 0.59) bottlenose dolphins (Barlow ~~2003~~ 2006). This is currently the best available abundance estimate for ~~this stock~~

the Hawaiian Islands EEZ stock. If the bottlenose dolphins in the 4-Island Region comprise a distinct stock, the most recent available estimate is the number of individuals identified during photo-identification studies between 1999 and 2003, 141 dolphins (Baird et al., in prep).

Minimum Population Estimate

The log-normal 20th percentile of the 2002 abundance estimate is ~~2,046~~ 2,029 bottlenose dolphins. The minimum population estimate for bottlenose dolphins in the Four-Island Region, based on photo-identification methods, is 141 dolphins (the number or of unique individuals identified between 1999 and 2003; Baird et al, in prep).

Current Population Trend

No data are available on current population trend.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate for this species in Hawaiian waters.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (~~2,046~~ 2,029) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of ~~0.50~~ 0.40 (for a stock of unknown status with a Hawaiian Islands EEZ ~~no estimated~~ fishery mortality ~~or~~ and serious injury rate CV > 0.80 ~~within the U.S. EEZ of the Hawaiian Islands~~; Wade and Angliss 1997), resulting in a PBR of ~~20~~ 16 bottlenose dolphins per year. If bottlenose dolphins in the 4-Island Region comprise a separate stock, the PBR would be the minimum population estimate (141) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a stock of unknown status with no reported fishery mortality during the last five years; Wade and Angliss 1997), resulting in a PBR of 1.4 bottlenose dolphins per year.

HUMAN CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Information on fishery-related mortality of cetaceans in Hawaiian waters is limited, but the gear types used in Hawaiian fisheries are responsible for marine mammal mortality and serious injury in other fisheries throughout U.S. waters. Gillnets appear to capture marine mammals wherever they are used, and float lines from lobster traps and longlines can be expected to occasionally entangle whales (Perrin et al. 1994). In Hawaii, some mortality of bottlenose dolphins has been observed in inshore gillnets ~~(including an entangled dolphin that stranded in 1998; NMFS/PIR, unpublished data)~~, but no estimate of annual human-caused mortality and serious injury is available, because these fisheries are not observed or monitored.

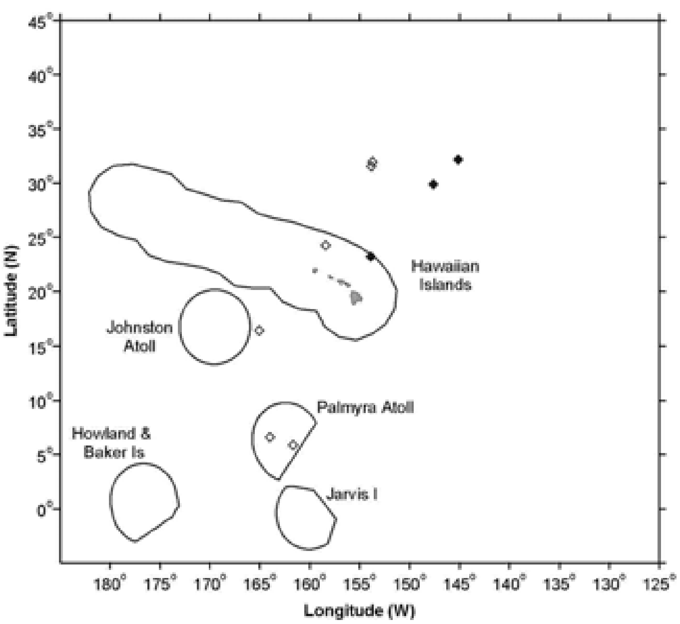

Figure 2. Locations of observed ~~sets (small dots),~~ bottlenose dolphin takes (filled diamonds) and possible takes of this species (open diamonds) in the Hawaii-based longline fishery, 1994-~~2002~~ 2004. Solid lines represent the U. S. EEZ. Set locations in this fishery are summarized in Appendix 1.

Interactions with cetaceans have been reported for all Hawaiian pelagic fisheries, and some of these interactions involved bottlenose dolphins (Nitta and Henderson 1993). Between 1994 and 2002 ~~two~~ three bottlenose dolphins were observed hooked or entangled in the Hawaii-based longline fishery ~~outside of U.S. EEZ waters~~, with approximately 4-26% ~~4-25%~~ of all effort observed (Table 1; Forney and Kobayashi 2005 ~~2004~~). During ~~the 905~~18,353 observed ~~trips with 11,014~~ sets, the average interaction rate of bottlenose dolphins was 0.16 ~~one~~ animals per 1,000 ~~905 fishing trips, or one animal per 11,014~~ sets. ~~Both animals caught~~ One of the bottlenose dolphins was killed, and the other two were considered seriously injured (Forney and Kobayashi 2005 ~~2004~~), based on an evaluation of the observer's description of the interaction and following established guidelines for assessing serious injury in marine mammals (Angliss and Demaster 1998). Average 5-yr estimates of annual mortality and serious injury for ~~1998-2002~~ 2000-2004 are ~~5.8~~ 0.8 (CV = 1.00) bottlenose dolphins within the Hawaiian Islands EEZ, and none outside of U.S. EEZs~~, and none within U.S. EEZs~~. ~~Several~~ Six additional unidentified cetaceans, which may have been bottlenose dolphins, were also taken in this fishery (Figure 2, Forney and Kobayashi 2005 ~~2004~~). Since 2001, the Hawaii-based longline fishery has undergone a series of regulatory changes, primarily to protect sea turtles (NMFS 2001). Potential impacts of these regulatory changes on the rate of bottlenose dolphin takes are unknown.

Bottlenose dolphins are one of the species commonly reported to take bait and catch from several Hawaiian sport and commercial fisheries (Nitta and Henderson 1993; Schlais 1984). Observations of bottlenose dolphins taking bait or catch have also been made in the day handline fishery (palu-ahi) for tuna, the handline fishery for mackerel scad, the troll fishery for billfish and tuna, and the inshore set gillnet fishery (Nitta and Henderson 1993). Nitta and Henderson (1993) indicated that bottlenose dolphins remove bait and catch from handlines used to catch bottomfish off the island of Hawaii and Kaula Island and on several banks of the Northwestern Hawaiian Islands. Fishermen claim interactions with dolphins that steal bait and catch are increasing. Interaction rates between dolphins and the NWHI bottomfish fishery have been estimated based on studies conducted in 1990-1993, indicating that an average of 2.67 dolphin interactions, most likely involving bottlenose and rough-toothed dolphins, occurred for every 1000 fish brought on board (Kobayashi and Kawamoto 1995). It is not known whether these interactions result in serious injury or mortality of dolphins. Beginning in the early 1970s the National Marine Fisheries Service received reports of fishermen shooting at bottlenose dolphins to deter them from taking fish catches (Nitta and Henderson 1993). Nitta and Henderson (1993) also reported that one bottlenose dolphin calf was removed from small-mesh set gillnet off Maui in 1991 and expressed surprise that bottlenose dolphins are "rarely reported entangled or raiding set gill nets in Hawaii," considering that they so often remove fish from fishing lines. One bottlenose dolphin entangled in a gillnet was reported stranded on Maui in 1998 (NMFS/PIR, unpublished data; Maldini 2003).

Table 1. Summary of available information on incidental mortality and serious injury of bottlenose dolphins (Hawaii stock) in commercial and gillnet fisheries, within and outside of the U.S. EEZs (Forney and Kobayashi 2005 ~~2004~~; NMFS/PIR unpublished data). Mean annual takes are based on ~~1998-2002~~ 2000-2004 data unless otherwise indicated; n/a = not available.

Fishery Name	Year	Data Type	Percent Observer Coverage	Mortality and Serious Injury outside of U.S. EEZs			Mortality and Serious Injury within Hawaiian Islands EEZ		
				Observed	Estimated (CV)	Mean Annual Takes (CV)	Observed	Estimated (CV)	Mean Annual Takes (CV)
Hawaii-based longline fishery	~~1998~~		~~4.6%~~	~~0~~	~~0 (-)~~		~~0~~	~~0 (-)~~	
	~~1999~~	~~1998-2002~~	~~3.5%~~	~~1~~	~~29 (1.0)~~		~~0~~	~~0 (-)~~	
	2000	observer data	~~11.8%~~ 11.0%	0	0 (-)	~~5.8 (1.0)~~ 0 (-)	0	0 (-)	~~0 (-)~~ 0.8 (1.0)
	2001		~~22.7%~~ 23.0%	0	0 (-)		0	0 (-)	
	2002		~~24.9%~~ 24.8%	0	0 (-)		0	0 (-)	
	2003		21.9%	0	0 (-)		1	4 (1.0)	
	2004		25.7%	0	0 (-)		0	0 (-)	
~~**Unidentified gillnet fishery**~~	~~1998~~	~~strandings~~					~~1~~	~~n/a~~	~~0.2 (n/a)~~
Minimum total annual takes within U.S. EEZ waters									~~0.2 (n/a)~~0.8 (1.0)

STATUS OF STOCK

The status of bottlenose dolphins in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA. The Hawaiian stock of bottlenose dolphins is not considered strategic under the 1994 amendments to the MMPA, because the estimated rate of fisheries related mortality or serious injury within the Hawaiian Islands EEZ (~~0.2~~ 0.8 animals per year) is less than the PBR (~~20~~ 16). However, there is no systematic monitoring of gillnet fisheries that may take this species, and the potential effects of interactions with the Hawaii-based longline fishery in international waters or the bottomfish fishery in the NWHI are not known. Insufficient information is available to determine whether the total fishery mortality and serious injury for bottlenose dolphins is insignificant and approaching zero mortality and serious injury rate.

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KILLER WHALE (*Orcinus orca*): Eastern North Pacific Southern Resident Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Killer whales have been observed in all oceans and seas of the world (Leatherwood and Dahlheim 1978). Although reported from tropical and offshore waters, killer whales prefer the colder waters of both hemispheres, with greatest abundances found within 800 km of major continents (Mitchell 1975). Along the west coast of North America, killer whales occur along the entire Alaskan coast (Braham and Dahlheim 1982), in British Columbia and Washington inland waterways (Bigg et al. 1990), and along the outer coasts of Washington, Oregon, and California (Green et al. 1992; Barlow 1995, 1997; Forney et al. 1995). Seasonal and year-round occurrence has been noted for killer whales throughout Alaska (Braham and Dahlheim 1982) and in the intracoastal waterways of British Columbia and Washington State, where pods have been labeled as 'resident,' 'transient,' and 'offshore' (Bigg et al. 1990, Ford et al. 1994) based on aspects of morphology, ecology, genetics, and behavior (Ford and Fisher 1982, Baird and Stacey 1988, Baird et al. 1992, Hoelzel et al. 1998). Through examination of photographs of recognizable individuals and pods, movements of whales between geographical areas have been documented. For example, whales identified in Prince William Sound have been observed near Kodiak Island (Matkin et al. 1999) and whales identified in Southeast Alaska have been observed in Prince William Sound, British Columbia, and Puget Sound (Leatherwood et al. 1990, Dahlheim et al. 1997).

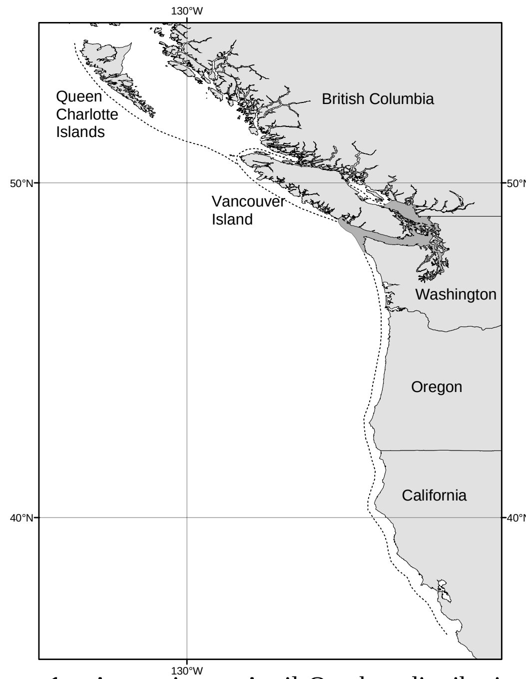

Figure 1. Approximate April-October distribution of the Eastern North Pacific Southern Resident killer whale stock (shaded area) and range of sightings (dotted line).

Studies on mtDNA restriction patterns provide evidence that the 'resident' and 'transient' types are genetically distinct (Stevens et al. 1989, Hoelzel 1991, Hoelzel and Dover 1991, Hoelzel et al. 1998). Analysis of 73 samples collected from eastern North Pacific killer whales from California to Alaska has demonstrated significant genetic differences among 'transient' whales from California through Alaska, 'resident' whales from the inland waters of Washington, and 'resident' whales ranging from British Columbia to the Aleutian Islands and Bering Sea (Hoelzel et al. 1998). However, low genetic diversity throughout this specie's world-wide distribution has hampered efforts to clarify its taxonomy. At an international symposium in cetacean systematics in May 2004, a workshop was held to review the taxonomy of killer whales. A majority of invited experts felt that the Resident- and Transient-type whales in the eastern North Pacific probably merited species or subspecies status (Reeves et al. 2004).

Most sightings of the Eastern North Pacific Southern Resident stock of killer whales have occurred in the summer in inland waters of Washington and southern British Columbia. However, pods belonging to this stock have also been sighted in coastal waters off southern Vancouver Island and Washington (Bigg et al. 1990, Ford et al. 2000, NWFSC unpubl. data). The complete winter range of this stock is uncertain. Of the three pods comprising this stock, one (J1) is commonly sighted in inshore waters in winter, while the other two (K1 and L1) apparently spend more time offshore (Ford et al. 2000). These latter two pods have been sighted as far south as Monterey Bay and central California in recent years (N. Black, pers. comm., K. Balcomb, pers. comm.) They sometimes have also been seen entering the inland waters of Vancouver Island from the north–through Johnstone Strait–in the spring (Ford et al. 2000), suggesting that they may spend time along the entire outer coast of Vancouver Island during the winter. In May 2003, these pods were sighted off the northern end of the Queen Charlotte Islands, the furthest north they had ever previously been documented (J. Ford, pers. comm.).

Based on data regarding association patterns, acoustics, movements, genetic differences and potential fishery interactions, five killer whale stocks are recognized within the Pacific U.S. EEZ: 1) the Eastern North Pacific Northern Resident stock - occurring from British Columbia through Alaska, 2) the Eastern North Pacific Southern Resident stock - occurring mainly within the inland waters of Washington State and southern British Columbia (see Fig. 1), 3) the Eastern North Pacific Transient stock - occurring from Alaska through California, 4) the Eastern North Pacific Offshore stock - occurring from Southeast Alaska through California, and 5) the Hawaiian stock. The Stock Assessment Reports for the Alaska Region contain information concerning the Eastern North Pacific Northern Resident and Eastern North Pacific Transient stocks.

POPULATION SIZE

The Eastern North Pacific Southern Resident stock is a trans-boundary stock including killer whales in inland Washington and southern British Columbia waters. Photo-identification of individual whales through the years has resulted in a substantial understanding of this stock's structure, behaviors, and movements. In 1993, the three pods comprising this stock totaled 96 killer whales (Ford et al. 1994). The population increased to 99 whales in 1995, then declined to 79 whales in 2001 before increasing slightly to ~~83~~91 whales in ~~2003~~2005 (Fig. 2; Ford et al. 2000; Center for Whale Research, unpubl. data). The 2001-2005~~, 2002, and 2003~~ counts include a whale born in 1999 (L-98) that was listed as missing during the annual census in May and June 2001 but was subsequently discovered alone in an inlet off the west coast of Vancouver Island (J. Ford, pers. comm.). ~~As of October 2003~~2005, L-98 ~~has~~ remained separate from L pod until 10 March 2006 when he died due to injuries associated with a vessel interaction in Nootka Sound. ~~and it remains unclear whether he will rejoin L pod in the future, either on his own or through a potential reintroduction effort~~. He will not be subtracted from the population until the official 2006 census is completed in May/June 2006. ~~For now, it will be included in the current population size.~~ In addition, ~~one~~ the three whales that were ~~have~~ not ~~been~~ observed during the fall 2005 surveys ~~2003~~ ~~however they~~ will not be confirmed as missing from the population until the official census is completed in May/June ~~2004~~ 2006 (Center for Whale Research, unpubl. data).

Minimum Population Estimate

The abundance estimate for this stock of killer whales is a direct count of individually identifiable animals. It is thought that the entire population is censused every year. This estimate therefore serves as both a best estimate of abundance and a minimum estimate of abundance. Thus, the minimum population estimate (N_{MIN}) for the Eastern North Pacific Southern Resident stock of killer whales is ~~83~~ 91 animals.

Current Population Trend

During the live-capture fishery that existed from 1967 to 1973, it is estimated that 47 killer whales, mostly immature, were taken out of this stock (Ford et al. 1994). The first complete census of this stock occurred in 1974. Between 1974 and 1993 the Southern Resident stock increased approximately 35%, from 71 to 96 individuals (Ford et al. 1994). This represents a net annual growth rate of 1.8% during those years. Since 1995, the population declined to 79 whales before increasing ~~in~~ from 2002-2005 ~~and 2003~~ to a total of ~~83~~ 91 whales (Ford et al. 2000; Center for Whale Research, unpubl. data).

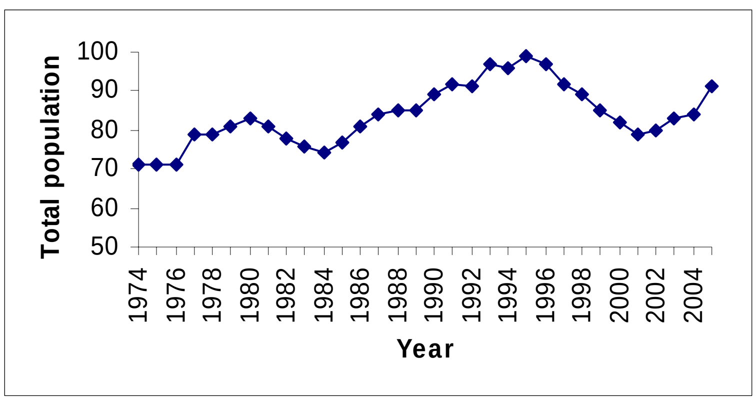

Figure 2. Population of Eastern North Pacific Southern Resident stock of killer whales, ~~1974-2003~~ 1974-2005. Each year's count includes animals first seen and first missed; a whale is considered first missed the year after it was last seen alive (Ford et al. 2000; Center for Whale Research, unpubl. data).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is currently unavailable for this stock of killer whales. Studies of 'resident' killer whale pods in British Columbia and Washington waters resulted in estimated population growth rates of 2.92% and 2.54% over the period from 1973 to 1987 (Olesiuk et al. 1990, Brault and Caswell 1993). For southern resident killer whales, estimates of the population growth rate have been made during the three periods when the population has been documented increasing since monitoring began in 1974. From 1974 to 1980 the population increased at a rate of 2.6%/year, 2.3%/year from 1985 to 1996, and 2.5%/year from 2002 to 2003 (Krahn et al. 2004). However, a population increases at the maximum growth rate (R_{MAX}) only when the population is at extremely low levels; thus, any of these ~~the~~ estimates ~~of 2.92%~~ may be an underestimate of R_{MAX}. Hence, until additional data become available, it is recommended that the cetacean maximum theoretical net productivity rate (R_{MAX}) of 4% be employed for this stock (Wade and Angliss 1997).

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (~~83~~91) times one-half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of ~~0.5~~ 0.1 (for an endangered ~~a depleted~~ stock, Wade and Angliss 1997), resulting in a PBR of ~~0.8~~ 0.18 whales per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

NMFS observers have monitored the northern Washington marine set gillnet fishery since 1988 (Gearin et al. 1994, 2000; P. Gearin, unpubl. data). Observer coverage ranged from approximately 40 to 83% in the entire fishery (coastal + inland waters) between 1998 and 2002. There was no observer coverage in this fishery ~~in~~ from 1999~~, 2001, or 2002~~-2003. However, the total fishing effort was 4, 46, ~~and~~ 4.5 and 7 net days (respectively) in those years, it occurred only in inland waters, and no killer whale takes were reported. No killer whale mortalities have been recorded in this fishery since the inception of the observer program.

In 1993, as a pilot for future observer programs, NMFS in conjunction with the Washington Department of Fish and Wildlife (WDFW) monitored all non-treaty components of the Washington Puget Sound Region salmon gillnet fishery (Pierce et al. 1994). Observer coverage was 1.3% overall, ranging from 0.9% to 7.3% for the various components of the fishery. Encounters (whales within 10 m of a net) with killer whales were reported, but not quantified, though no entanglements occurred.

In 1994, NMFS and WDFW conducted an observer program during the Puget Sound non-treaty chum salmon gillnet fishery (areas 10/11 and 12/12B). A total of 230 sets were observed during 54 boat trips, representing approximately 11% observer coverage of the 500 fishing boat trips comprising the total effort in this fishery, as estimated from fish ticket landings (Erstad et al. 1996). No interactions with killer whales were observed during this fishery. The Puget Sound treaty chum salmon gillnet fishery in Hood Canal (areas 12, 12B, and 12C) and the Puget Sound treaty sockeye/chum gillnet fishery in the Strait of Juan de Fuca (areas 4B, 5, and 6C) were also monitored in 1994 at 2.2% (based on % of total catch observed) and approximately 7.5% (based on % of observed trips to total landings) observer coverage, respectively (NWIFC 1995). No interactions resulting in killer whale mortalities were reported in either treaty salmon gillnet fishery.

Also in 1994, NMFS, WDFW, and the Tribes conducted an observer program to examine seabird and marine mammal interactions with the Puget Sound treaty and non-treaty sockeye salmon gillnet fishery (areas 7 and 7A). During this fishery, observers monitored 2,205 sets, representing approximately 7% of the estimated number of sets in the fishery (Pierce et al. 1996). Killer whales were observed within 10 m of the gear during 10 observed sets (32 animals in all), though none were observed to have been entangled.

Killer whale takes in the Washington Puget Sound Region salmon drift gillnet fishery are unlikely to have increased since the fishery was last observed in 1994, due to reductions in the number of participating vessels and available fishing time (see details in Appendix 1). Fishing effort and catch have declined throughout all salmon fisheries in the region due to management efforts to recover ESA-listed salmonids.

An additional source of information on the number of killer whales killed or injured incidental to commercial fishery operations is the self-reported fisheries information required of vessel operators by the MMPA. During the period between 1994 and ~~2002~~2004 , there were no fisher self-reports of killer whale mortalities from any fisheries operating within the range of this stock. However, because logbook records (fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994), these are considered to be minimum estimates. Logbook data are available for part of 1989-1994, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-1995 phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 in Angliss and Lodge 2002 for details).

Due to a lack of observer programs, there are few data concerning the mortality of marine mammals incidental to Canadian commercial fisheries. Since 1990, there have been no reported fishery-related strandings of killer whales in Canadian waters. However, in 1994 one killer whale was reported to have contacted a salmon gillnet but did not entangle (Guenther et al. 1995). Data regarding the level of killer whale mortality related to commercial fisheries in Canadian waters are not available, though the mortality level is thought to be minimal.

During this decade there have been no reported takes from this stock incidental to commercial fishing operations (D. Ellifrit, pers. comm.), no reports of interactions between killer whales and longline operations (as occurs in Alaskan waters; see Yano and Dahlheim 1995), no reports of stranded animals with net marks, and no photographs of individual whales carrying fishing gear. The total fishery mortality and serious injury for this stock is zero.

Other Mortality

According to Northwest Marine Mammal Stranding Network records, maintained by the NMFS Northwest Region, no human-caused killer whale mortalities or serious injuries were reported from non-fisheries sources in 1998-~~2003~~2004. There was documentation of a whale-boat collision in Haro Strait in 2005 which resulted in a minor injury to a whale. In 2006, whale L98 was killed during a vessel interaction. It is important to note that L98 had become habituated to regularly interacting with vessels during its isolation in Nootka Sound. The annual level of human-caused mortality for this stock over the past five years is 0.2 animals per year (reflecting the vessel strike mortality of animal L98 in 2006).

STATUS OF STOCK

~~NMFS received a petition from the Center for Biological Diversity and 10 co-petitioners on 2 May 2001 (an 11th co-petitioner was added on 16 July 2001) to list the Eastern North Pacific Southern Resident stock of killer whales as an "endangered" or "threatened" species under the Endangered Species Act (ESA) and to designate critical habitat for this stock under that Act. NMFS determined that the petition presented substantial scientific information indicating that a listing may be warranted thus was required to conduct an ESA status review of the stock (66 FR 42499, 13 August 2001). NMFS established a Biological Review Team (BRT) for this purpose and, in accordance with the BRT report (Krahn et al. 2002), determined that Southern Resident killer whales are not a "species" under the ESA and that a listing of "threatened" or "endangered" was not warranted (67 FR 44133, 1 July 2002). The BRT report (Krahn et al. 2002) identified potential risk factors that could influence this killer whale population, including: changes in prey availability, caused by fluctuations in environmental conditions (e.g., El Niño events); high levels of contaminants (Ross et al. 2000, Ylitalo et al. 2001); noise generated by whale-watching vessels; diseases and parasites; declines in stocks of salmon which are important prey; and catastrophes, such as oil spills and blooms of harmful algae. However, few quantitative data are available to determine which, if any, of these factors are likely to place the population in imminent danger of extinction. NMFS announced its intention to seek new information on the taxonomy, biology, and ecology of these whales, as well as potential threats to their continued existence, and reassess their status under the ESA within 4 years (67 FR 44133, 1 July 2002). NMFS reviewed the status of the stock under the MMPA, determined that the stock is below its Optimum Sustainable Population (OSP), classified the stock as "depleted" under the MMPA, and announced its intention to prepare a Conservation Plan to reverse the decline and to promote recovery of the stock to OSP (68 FR 31980, 29 May 2003). In December 2003, the U.S. District Court set aside NMFS's not warranted finding relative to the 2001 ESA petition. Because the finding concluded that NMFS has erred by using "inaccurate" global species of Orcinus orca when considering whether southern residents were a distinct population segment (DPS), NMFS reconvened the southern resident killer whale Biological Review Team to review taxonomy and other new information that had become available since its 2002 status review. The BRT concluded that based on the new information southern resident killer whales were a DPS of the North Pacific resident taxon (Krahn et al. 2004).~~ On November 15, 2005 NMFS listed Southern Resident killer whales as endangered under the ESA.

~~Based on currently available data, the t~~Total annual fishery mortality and serious injury for this stock (0) is not known to exceed 10% of the calculated PBR (~~0.08~~ 0.018) and, therefore, appears to be insignificant and approaching zero mortality and serious injury rate. The estimated annual level of human-caused mortality and serious injury of ~~zero~~ 0.2 animals per year ~~is not known to~~ exceeds the PBR (~~0.8~~ 0.18). ~~However, because the Eastern North Pacific~~ Southern Resident killer whales are formally listed as ~~stock has been designated as "depleted"~~ "endangered" under the ~~MMPA~~ ESA and consequently the stock is automatically considered as a "depleted" and~~, it is classified as a~~ "strategic" stock under the MMPA.

~~In April 1999, Canada's Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed resident killer whales in British Columbia as "threatened," i.e., likely to become "endangered" if limiting factors are not reversed (Baird 1999). In November 2001, COSEWIC split the original listing for resident killer whales into two populations. The northern resident population was designated as "threatened" and the southern resident population was designated as "endangered," i.e., facing imminent extirpation or extinction (COSEWIC 2003). In~~

~~June 2000, the Washington Department of Fish and Wildlife (WDFW) designated killer whales in Washington State as a "state candidate species" (a species that the Department will review for possible listing as "state endangered, threatened, or sensitive"). In October 2003, WDFW released a draft status review which proposes that Southern Resident killer whales be added to the state's endangered species list (WDFW 2003). In April 2004, the Washington State Fish and Wildlife Commission approved the addition of killer whales to the State's endangered species list.~~

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The Marine Mammal Protection Act (MMPA) requires NMFS to publish a list of commercial fisheries (List Of Fisheries or "LOF") and classify each fishery based on whether incidental mortality and serious injury of marine mammals is frequent (Category I), occasional (Category II), or unlikely or unknown (Category III). The LOF is published annually in the Federal Register. The categorization of a fishery in the LOF determines whether participants in that fishery are subject to certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan requirements. The categorization criteria as they appear in the LOF is reprinted below:

The fishery classification criteria consist of a two-tiered, stock-specific approach that first addresses the total impact of all fisheries on each marine mammal stock, and then addresses the impact of individual fisheries on each stock. This approach is based on consideration of the rate, in numbers of animals per year, of incidental mortalities and serious injuries of marine mammals due to commercial fishing operations relative to the Potential Biological Removal (PBR) level for each marine mammal stock. The MMPA (16 U.S.C. 1362 (20)) defines the PBR level as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. This definition can also be found in the implementing regulations for section 118 at 50 CFR 229.2.

Tier 1: If the total annual mortality and serious injury across all fisheries that interact with a stock is less than or equal to 10 percent of the PBR level of the stock, all fisheries interacting with the stock would be placed in Category III. Otherwise, these fisheries are subject to the next tier (Tier 2) of analysis to determine their classification.

Tier 2, Category I: Annual mortality and serious injury of a stock in a given fishery is greater than or equal to 50 percent of the PBR level.

Tier 2, Category II: Annual mortality and serious injury of a stock in a given fishery is greater than 1 percent and less than 50 percent of the PBR level.

Tier 2, Category III: Annual mortality and serious injury of a stock in a given fishery is less than or equal to 1 percent of the PBR level.

While Tier 1 considers the cumulative fishery mortality and serious injury for a particular stock, Tier 2 considers fishery-specific mortality and serious injury for a particular stock. Additional details regarding how the categories were determined are provided in the preamble to the final rule implementing section 118 of the MMPA (60 FR 45086, August 30, 1995). Since fisheries are categorized on a per-stock basis, a fishery may qualify as one Category for one marine mammal stock and another Category for a different marine mammal stock. A fishery is typically categorized on the LOF at its highest level of classification (e.g., a fishery that qualifies for Category III for one marine mammal stock and for Category II for another marine mammal stock will be listed under Category II).

Other Criteria That May Be Considered

In the absence of reliable information indicating the frequency of incidental mortality and serious injury of marine mammals by a commercial fishery, NMFS will determine whether the incidental serious injury or mortality qualifies for Category II by evaluating other factors such as fishing techniques, gear used, methods used to deter marine mammals, target species, seasons and areas fished, qualitative data from logbooks or fisher reports, stranding data, and the species and distribution of marine mammals in the area, or at the discretion of the Assistant Administrator for Fisheries (50 CFR 229.2).

This appendix describes commercial fisheries that occur in California, Oregon, Washington, and Hawaiian waters and that interact or may interact with marine mammals. The first three sections describe sources of marine mammal mortality data for these fisheries. The fourth section describes the commercial fisheries for these states. A list of all known fisheries for these states was published as a proposed rule in the Federal Register, ~~vol. 69 no. 231 dated 02 December 2004~~ 71 FR 20941, 24 April 2006.

1. Sources of Mortality/Injury Data

There are three major sources of marine mammal mortality/injury data for the active commercial fisheries in California, Oregon, and Washington. These sources are the NMFS Observer Programs, the Marine Mammal Authorization Program (MMAP) data, and the NMFS Marine Mammal Stranding Network (MMSN) data. Each of these data sources has a unique objective. Data on mammal mortality and injury are reported to the MMAP by fishers in any commercial fisheries. Marine mammal mortality and injury is also monitored by the NMFS Marine Mammal Stranding Network (MMSN). Data provided by the MMSN is not duplicated by either the NMFS Observer Program or MMAP reporting. Human-related data from the MMSN include occurrences of mortality due to entrainment in power station intakes, ship strikes, shooting, evidence of net fishery entanglement (net remaining on animal, net marks, severed flukes), and ingestion of hooks.

2. Marine Mammal Reporting from Fisheries

In 1994, the MMPA was amended to implement a long-term regime for managing mammal interactions with commercial fisheries (the Marine Mammal Authorization Program, or MMAP). Logbooks are no longer required - instead vessel owners/operators in any commercial fishery (Category I, II, or III) are required to submit one-page pre-printed reports for all interactions (including those that occur while an observer is onboard) resulting in an injury or mortality to a marine mammal. The report must include owner/operator's name and address, vessel name and ID, where and when the interaction occurred, the fishery, species involved, and type of injury (if the animal was released alive). These postage-paid report forms are mailed to all Category I and II fishery participants that have registered with NMFS, and must be completed and returned to NMFS within 48 hours of returning to port for trips in which a marine mammal injury or mortality occurred. The number of self-reported marine mammal interactions is considerably lower than the number reported by fishery observers, even though observer reports are typically based on 20% observer effort. For example, from ~~1998-2002~~ 2000-2004, there were ~~115~~ 112 fisher self-reports of marine mammal interactions in the California swordfish/thresher shark drift gillnet fishery. This compares with ~~201~~ 141 observed interactions over the same period, based on only 20% observer coverage. This suggests that fisher self-reports are grossly underreported. A summary comparing fisher self-reports and observer reports of marine mammal interactions for the swordfish drift gillnet fishery is given in Table 1 of this Appendix.

3. NMFS Marine Mammal Stranding Network data

~~In California, for the years 1998 through 2002 there were 120, 154, 152, 100, and 183 cetacean strandings respectively and 3568, 1066, 1857, 1482, and 2,367 pinniped strandings respectively. In Oregon/Washington from 1998-2002, there were 43, 50, 48, 28, and 17 reported cetacean strandings and 321, 267, 235, 250, 139 pinniped strandings, respectively.~~ From 2000-2004, there were 1,022 cetacean and 13,215 pinniped strandings recorded in California, Oregon, and Washington states. Approximately 10% of all cetacean and ~~7~~6% of all pinniped strandings showed evidence of human-caused mortality during this period. Human-related causes of mortality include: entrainment in power station intakes, shooting, net fishery entanglement, and hook/line, set-net and trap fishery interaction. A species summary of all cetacean and pinniped strandings for the period ~~1998-2002~~ 2000-2004 is given in Table 2 of this Appendix.

4. Fishery Descriptions

Category I, CA/OR thresher shark/swordfish drift gillnet fishery (≥14 inch mesh)

Note: NMFS has proposed reclassifying this fishery to a Category I, based on a revised PBR level for short-finned pilot whales and an observed take of a short-finned pilot whale in this fishery in 2003 (Federal Register ~~vol.~~ 69 FR 70094, ~~no. 231 dated~~ 02 December 2004).

Number of permit holders: The number of eligible permit holders in California for ~~1998-2002~~ 2000-2004 are ~~148~~127, ~~136~~ 114, ~~126~~ 106, ~~113~~ 99, and ~~105~~ 96 respectively. Permits are non-transferable and are linked to individual fishermen, not vessels.

Number of active permit holders: The number of vessels active in this fishery from ~~1998-2002~~ 2000-2004 were ~~123~~ 78, ~~96~~ 69, ~~81~~ 50, ~~65~~, 43, and ~~56~~ 43 respectively. Information on the number of permit holders is obtained from the Status of the U.S. west coast fisheries for Highly Migratory Species through 2004; Stock Assessment and Fishery Evaluation report available from the Pacific Fishery Management Council website (www.pcouncil.org).

Total effort: Both estimated and observed effort for the drift-net fishery during the calendar years 1990 through 2002 are shown in Figure 7. In ~~2002~~ 2004 there was an estimated ~~1,630~~ 1,084 effort-days, where an effort-day is defined to be one day of effort by one vessel. (In this fishery, 1 effort-day is equivalent to 1 set.). There were ~~360~~ 223 (~~64~~ 41 trips) observed effort-days in ~~2002~~ 2004.

Geographic range: Effort in this fishery ranges from the U.S./Mexico border north to waters off the state of Oregon. For this fishery there are area-season closures (see below). Figures 1-5 show locations of observed sets and Figure 6 shows approximate locations of observed marine mammal entanglements for the period 1998-2002.

Seasons: This fishery is subject to season-area restrictions. From February 1 to May 15 effort must be further than 200 nautical miles (nmi) from shore; from May 16 to August 14, effort must be further than 75 nmi from shore, and from August 15 to January 31 there is only the 3 nmi off-shore restriction for all gillnets in southern California (see angel shark/halibut fishery below). The majority of the effort occurs from October through December. A season-area closure to protect leatherback sea turtles was implemented in this fishery in August 2001. The closure area prohibits drift gillnet fishing from August 15 through November 15, in the area bounded by straight lines from Point Sur, California (N36° 17') to N 34° 27' W 123° 35', west to W129°, north to N 45°, then east to the Oregon coast. ~~The Highly Migratory Species Management Team of the Pacific Fishery Management Council is considering re-opening the area south of Point Sur, California in this fishery.~~ In March 2006, the Pacific Fishery Management Council approved a recommendation to NMFS to reopen the current closure area under an exempted fishing permit (EFP). The EFP requires 100% observer coverage and limits the number of sets fished to 300. Additionally, fishing in the area would cease prior to the 300 set limit if 2 leatherback turtles are entangled. In addition, fishing would cease if one mortality or serious injury is documented for any of the following species: gray whale, short-finned pilot whale, sperm whale, fin whale, humpback whale, and minke whale. NMFS may modify this recommendation and will make a final decision on the EFP in 2006. An additional season-area closure south of Point Conception and east of W120 degrees longitude is effective during the months of June, July, and August during El Niño years to protect loggerhead turtles (Federal Register, ~~Vol~~ 68 FR 69962, ~~No 241,~~ 16 December 2003).

Gear type and fishing method: Typical gear used for this fishery is a 1000 fathom gillnet with a stretched mesh size typically ranging from 18-22 inches (14 inch minimum). The net is set at dusk and allowed to drift during the night after which, it is retrieved. The fishing vessel is typically attached to one end of the net. Soak duration is typically 12-14 hours depending on the length of the night. Net extender lengths of a minimum 36 ft. became mandatory for the 1997-1998 fishing season. The use of acoustic warning devices (pingers) became mandatory 28 October 1997.

Regulations: The fishery is managed under a Fishery Management Plan (FMP) ~~administered~~ developed by the Pacific Fishery Management Council and NMFS.

Management type: The drift-net fishery is a limited entry fishery with seasonal closures and gear restrictions (see above). The state of Oregon restricts landing to swordfish only.

Comments: This fishery has had a NMFS observer program in place since July 1990. Due to bycatch of strategic stocks including short-finned pilot whale, beaked whales, sperm whale and humpback whale, a Take Reduction Team was formed ~~February 12,~~ in 1996. Since then, the implementation of increased extender lengths and the deployment of pingers have substantially decreased cetacean entanglement. The fraction of active vessels in this fishery that are not observed owing to a lack of berthing space for observers has been increasing as larger vessels drop out of this fishery.

Category I, CA angel shark/halibut and other species set gillnet fishery (>3.5 inch mesh).

Note: The "**CA angel shark/halibut set gillnet fishery**" and "**CA other species, large mesh (>3.5 in) set gillnet fishery**" were previously listed as separate fisheries. Angel shark and halibut are typically targeted using 8.5 inch mesh while the remainder of the fishery targets white seabass and yellowtail using 6.5 inch mesh. In recent years, there has been an increasing number of 6.0-6.5 inch mesh sets fished using drifting methods; this component is now identified as a separate fishery (see "**CA yellowtail, barracuda, white seabass, and tuna drift gillnet fishery (>3.5 and <14 in mesh)**" fishery described below).

Number of permit holders: There is no specific permit category for this fishery. Overall, the current number of legal permit holders for gill and trammel nets, excluding swordfish drift gillnets and herring gillnets for ~~1998 through 2002~~ 2000-2004 are, respectively, ~~255, 245,~~ 232, 223, ~~and~~ 209, 193, and 187. Information on permit numbers is available from the California Department of Fish and Game website (http://www.dfg.ca.gov/licensing).

Number of active permit holders: ~~For the period 1998-2001, there were 45, 66, 62, 57, and 52 active permit holders in this fishery.~~ Based on logbook data, there were at least 41 active permit holders from April 2003 to April 2004.

Total effort: ~~Effort in the angel shark/halibut set-net fishery has historically been as high as 7,000 days in 1991, declined to fewer than 2,000 days following a gillnet closure within 3 nautical miles of the mainland and 1 nmi of the Channel Islands in 1994, and has been steady at about 3,000-4,000 days in the last five years.~~ From 1999-2003, estimated fishing effort (from logbooks) in this fishery has been 4,173, 3,736, 3,388, 3,220, and 2,788 days, respectively. A summary of estimated fishing effort and observer coverage for the years 1990-~~2002~~2003 is shown in Figure 8. Effort in the white seabass and yellowtail portion of this fishery from ~~1998 to 2002~~ 1999-2003 were ~~761,~~ 460, 657, 551, ~~and~~ 733 and 789 days, respectively. ~~For the first two quarters of 2003, there were 366 days fished.~~ A portion of the effort in the white seabass and yellowtail fishery utilizes drifting nets (see "CA yellowtail, barracuda, white seabass, and tuna drift gillnet fishery (>3.5 and <14 in mesh)" fishery description below).

Geographic range: Effort in this fishery previously ranged from the U.S./Mexico border north to Monterey Bay and was localized in more productive areas: San Ysidro, San Diego, Oceanside, Newport, San Pedro, Ventura, Santa Barbara, Morro Bay, and Monterey Bay. Fishery effort is now predominantly in the Ventura Flats area off of Ventura, the San Pedro area between Pt. Vicente and Santa Catalina Island and in the Monterey Bay area. The central California portion of the fishery from Point Arguello to Point Reyes has been closed since September 2002 when a ban on gillnets inshore of 60 fathoms took effect.

Seasons: This fishery operates year round. Effort generally increases during the summer months and declines during the last three months of a year.

Gear type and fishing method: Typical gear used for this fishery is a 200 fathom gillnet with a stretched mesh size of 8.5 inches. The component of this fishery that targets white seabass and yellowtail utilizes 6.5 inch mesh. The net is generally set during the day and allowed to soak for up to 2 days. Soak duration is typically 8-10, 19-24, or 44-49 hours. The depth of water ranges from 15-50 fathoms with most sets in water depths of 15-35 fathoms.

Regulations: This fishery is managed by the California Dept. of Fish and Game in accordance with state and federal laws.

Management type: The halibut/angel shark set-net fishery is a limited entry fishery with gear restrictions and area closures.

Comments: An observer program for the halibut/angel shark portion of this fishery operated from 1990-94 and was discontinued after area closures were implemented in 1994, which prohibited gillnets within 3 nmi of the mainland and within 1 nmi of the Channel Islands in southern California. NMFS re-established an observer program for this fishery in Monterey Bay in 1999-2000 due to a suspected increase in harbor porpoise mortality in Monterey Bay. In 1999 and 2000, fishery mortality exceeded PBR for the Monterey Bay harbor porpoise stock, and the stock is currently designated as strategic. In the autumn of 2000, the California Department of Fish and Game implemented the first in a series of emergency area closures to set gillnets within 60 fathoms along the central California coast. This effectively reduced fishing effort to negligible levels in 2001 and 2002 in Monterey Bay. A ban on gill and trammel nets inside of 60 fathoms from Point Reyes to Point Arguello became effective in September 2002. Mortality of marine mammals continues in this fishery, as evidenced by fisher self-reports under the Marine Mammal Authorization Program (MMAP) from 2000-2005. During this time, fishermen reported mortalities totalling 50 California sea lions, 20 harbor seals, one northern elephant seal and one unidentified common dolphin. NMFS plans on reinitiating some level of observer coverage in this fishery in 2006.

Category I, Hawaii swordfish, tuna, billfish, mahi mahi, wahoo, and oceanic shark longline/set line fishery.[1]

Note: The classification of this fishery was elevated to Category I in 2004 based on revised PBR levels of false killer whales and observed false killer whale mortalities in this fishery (Federal Register ~~Vol.~~ 69 FR 48407 ~~No.~~ 1~~53~~, ~~dated~~ 10 August 2004).

Number of permit holders: The number of Hawaii longline limited access permit holders is 164. Not all such permits are renewed and used every year (approximately 126 were renewed in 2003). Most holders of Hawaii longline limited access permits are based in, or operate out of, Hawaii**.** Longline general permits are not limited by number. Approximately 67 longline general permits were issued in 2003, about 48 of which were active. In 2003 all but two holders of longline general permits were based in, or operated out of, American Samoa. The remaining two, neither of which was active in 2003, were based in the Mariana Islands (Federal Register 69 FR 17329, 2 April 2004~~, Volume 69 Number 64~~).

Number of active permit holders: From 1998-2002 there were 115, 122, 125, 101, and 102 vessels actively fishing, respectively. There were 126 permits renewed in 2003 (Federal Register 69 FR 17329, 2 April 2004, ~~Volume 69 Number 64~~). In 2004, there were 125 Hawaii longline limited access permits renewed, with 119 active. In 2004, there were 40 active permits in American Samoa.

Total effort: For the years 1998-2002, there were 1,181, 1,165, 1,135, 1,075, and 1,193 trips made respectively. The number of hooks set has steadily increased since 1997 (15.5 million) and peaked in 2002 with 27 million hooks set. In 2002, most effort occurred within the U.S. EEZ (approximately 15 million hooks set), while 12 million hooks were set outside the U.S. EEZ. At Kingman Reef and Palmyra Atoll there were 2.1 million hooks set in 2002. In 2003, there were 1,214 trips recorded (with tuna as the target species). There were a total of 29.8 million hooks set in 2003, of these, 15 million occurred outside the U.S. EEZ, 11 million within the Main Hawaiian Islands EEZ, 2.7 million within the Northwest Hawaiian Islands EEZ, and the remaining 0.9 million within other U.S. possession EEZs. The preliminary estimate of hooks fished in 2004 is 32 million hooks. 2003 logbook data for American Samoa consisted of 932 trips by 51 vessels, which made 6,220 sets, with 14.2 million hooks fished. Preliminary logbook data from 2004 in American Samoa consists of 623 trips by 40 vessels, which made 4,804 sets, with 11.6 million hooks fished.

Geographic range: This fishery encompasses a huge geographic range extending North-South from 40° N to the equator and East-West from Kure Atoll to as far as 135° W. Fishing for swordfish generally occurs north of Hawaii, (as much as 2,000 miles from Honolulu), whereas fishing for tunas occurs around the Main Hawaiian Islands (MHI) and south of the Hawaiian Islands. New regulations published in 2004 lift previous area closures north of the equator.

Seasons: This fishery operates year-round. Effort is generally lower in the third quarter of the year.

Gear type: The basic unit of gear is the main line which is made of monofilament and stored on a large hydraulic reel. Eight hundred to 1000 hooks are attached to 30 to 40 miles of main line on a typical fishing day. Shallow sets for swordfish and deep sets for tuna are fished with a requirement that the fishermen must declare prior to departure which set type will be employed. (There was no Hawaii-based shallow set swordfish fishery from 2001-2003). All shallow swordfish sets are required to utilize size 18/0 circle hooks with a 10 degree offset and mackerel bait (the use of squid bait is prohibited). Deployment and retrieval of gear must occur at night. For deep sets, all float lines must be at least 20 meters in length; with a minimum of 15 branch lines between any two floats (except basket-style longline gear which may have as few as 10 branch lines between any two floats); without the use of light sticks; and resulting in the possession or landing of no more than 10 swordfish (Xiphias gladius) at any time during a given trip. As used in this definition “float line” means a line used to suspend the main longline beneath a float and ``light stick'' means any type of light emitting device, including any fluorescent “glow bead”, chemical, or electrically powered light that is affixed underwater to the longline gear ~~(Federal Register 2 April 2004 Volume 69 Number 64)~~. There are currently no Hawaii longline vessels deploying basket gear.

[1] This fishery description was provided in part by Chris Yates (NMFS) and from published fishery regulations in the Federal Register Vol. 69. No. 153, dated 10 August 2004.

While similar, swordfish and tuna gear differ in the depth at which it is deployed, the number of hooks deployed, and the time of day at which it is set. Both styles use a monofilament mainline that is generally 3.2- 4.0 mm in diameter that is stored, deployed, and retrieved using a large hydraulic reel (some vessels may have two). In general, swordfish gear is deployed at an average depth (deepest) of 70m, with 600-1000 hooks deployed per day (3-6 hooks between floats), and the line is set at night and hauled during daylight hours. Additionally, float lines are usually less than the required twenty meters (~10m) for tuna fishing. Because some swordfish vessels carry two reels of mainline, it is not uncommon for swordfish vessels to set as much as 60 miles of line in a day. In contrast, tuna gear is set much deeper (~200m), with 1500-2200 hooks deployed per day (20-35 hooks between floats), the line is set in the morning and hauled in the evening. In addition, tuna mainline is deployed using a hydraulic line shooter. Regulations permit a minimum of 15 hooks between floats. There is no minimum for trips targeting swordfish. The line shooter sends the line off the vessel faster than the vessel is moving creating deep arcing caternaries in the line. This allows them to target deep dwelling tunas. Swordfish mainline is set at the same speed as the vessel to keep the line in shallower depths. Finally, lightsticks are prohibited during tuna (deep set) fishing operations. These are allowed in the swordfish fishery.

The leaders attached to the mainline also differ between the two fisheries. A tuna leader is usually comprised of a hook immediately followed by a length of wire (1-2 mm thick) which is attached to a weighted swivel. The rest of the tuna leader in comprised of ~2mm thick monofilament and a snap for attachment to the mainline. The swordfish gear is comprised of a 18/0 or larger circle hook attached to a ~ 10m length of ~2mm monofilament line to a weighted swivel followed by another ~10m length of ~2mm monofilament. All attachments are made using loops secured by crimps.

Vessel operators are required to call NMFS for possible observer placement 72 hours prior to departure. At that time they must declare if they intend to go on a shallow-set or deep-set fishing trip. Regulations prohibiting the presence of lightsticks and float lines shorter than 20m aboard vessels on declared deep-set trips preclude fishermen from fishing trip types while at sea - additionally a vessel returning from a deep-set trip cannot land more than 10 swordfish (50 CFR 660.22).

Additional requirements for sea birds ~~go~~ went into effect 18 January 2006 for vessels fishing above 23 degrees north latitude (Federal Register 70 FR 75075, 19 December 2005). ~~New seabird regulations will take effect in 2005.~~ Fishermen will be given a choice between side setting and employing a suite of seabird mitigation measures. Currently, regulations require deep-setting vessels to dye their bait blue, thoroughly thaw the bait, and throw all offal on the opposite side of the vessel from which fishing operations are taking place. (There have been no observations of marine mammals feeding on offal discarded from Hawaii-based longline vessels.) Additionally, these vessels are required to use a line shooter – which they would have anyway – and at least forty-five gram weights on the line.

<u>Regulations:</u> Effort is required to be outside of 50 nautical miles from the entire Northwestern Hawaiian islands (NWHI) because of possible protected species (monk seal) interactions. Several 25-75 mile closed areas also exist around the MHI to prevent gear conflicts with smaller fishing vessels. Current regulations require 100% observer coverage for shallow swordfish sets and 20% observer coverage for deep tuna sets. There are fleet-wide annual limits on the number of allowable sea turtle interactions in this fishery (16 leatherbacks or 17 loggerheads). The shallow set component of the fishery is closed if either threshold is reached, or is expected to be reached Federal Register 69 FR 17329, April 2, 2004 ~~(Volume 69, Number 64)~~. There is an annual limit of 2,120 shallow sets north of the equator. Vessel operators must obtain single shallow set certificates from NMFS, which are transferable, and valid for one calendar year. Hawaii-based longline vessels are prohibited from making more shallow-sets north of the equator during a trip than the number of valid shallow-set certificates on board the vessel. Within 72 hours of landing a pelagic management unit species, vessel operators are required to submit one valid shallow-set certificate to the Regional Adminstrator for every shallow set fished north of the equator during a fishing trip. On 14 March 2006, the Western Pacific Regional Fishery Management Council voted to initiate an emergency closure of the Hawaii longline swordfish fishery because the fishery had already reached allowable interaction levels with loggerhead turtles in 2006. The shallow set component of the fishery north of the equator was closed on 20 March 2006 (Federal Register 71 FR 14824, 24 March 2006).

<u>Management type:</u> Federal limited access program. This fishery is managed under a Fishery Management Plan (FMP), developed by the Western Pacific Fishery Management Council and NMFS.

Comments: This Hawaii longline fishery is active year-round and targets swordfish and tuna, other species are caught incidentally. Interactions with bottlenose dolphins, false killer whales, humpback whales, short-finned pilot whales, spinner dolphins, short-beaked common dolphins, pantropical spotted dolphins, Blainville's beaked whale, sperm whales, and Risso's dolphins have been documented[2]. Longline hooks have also been recovered from Hawaiian monk seals, but these were not observed during longline fishing operations. Due to interactions with protected species, especially turtles, this fishery has been observed since February 24, 1994. Initially, observer coverage was less than 5%, increased to 10% in 2000, and has exceeded 20% in 2001 and 2002. In 2003, observer coverage was 22.2% (based on vessel departures), with 6.4 million hooks observed from 3,204 sets. Observed injuries of marine mammals in this fishery in 2003 included 2 false killer whales, 1 unidentified cetacean and 1 unidentified whale. Additionally, there was one observed mortality of a bottlenose dolphin (Pacific Islands Regional Office preliminary report dated 9 February 2004). In 2004, observer coverage was 24.6% (based on vessel departures), with 7.9 million hooks observed from 3,958 sets. Observed injuries of marine mammals in this fishery in 2004 included 5 false killer whales, 1 humpback whale and 1 short-finned pilot whale. Additionally, there was one observed mortality of a false killer whale. In the shallow set component of this fishery, observer coverage in 2004 was 100% (88 sets and 76,750 hooks observed). No marine mammal interactions were observed in the shallow set component of the fishery (Pacific Islands Regional Office preliminary report dated 25 January 2005).

Category II, CA yellowtail, barracuda, white seabass, and tuna drift gillnet fishery (>3.5 and <14 in mesh)

Note: This fishery has developed recently as an offshoot of the "**CA other species, large mesh (>3.5 in) set gillnet fishery**" (see above). Fishermen use the same gear as in the set gillnet fishery (typically 6.5 inch mesh nets, 100-200 fathoms in length, except that they instead utilize drifting nets to target white seabass and yellowtail. Albacore tuna and barracuda are also targeted in this fishery.

Number of permit holders: There are approximately 24 active permit holders in this fishery.

Total effort: ~~In the first two quarters of 2003, there were 366 days fished in the white seabass - yellowtail fishery. Of these 366 effort days, 69 days (19%) were drift sets, 267 (73%) were set gillnets, and 30 days (8%) were unspecified set type. In 2002, there were a total of 733 days fished in the white seabass - yellowtail fishery. Of these 733 effort days, 195 days (27 %) were drift sets, 447 days (61%) were set gillnets, and 91 days (12%) were unspecified set type.~~ From 1999-2003, there were 140, 173, 111, 195, and 202 small-mesh drift gillnet sets fished, respectively, as determined from California Department of Fish and Game logbook data.

Geographic range: This drift gillnet component of this fishery operates primarily south of Point Conception. Observed sets have been clustered around Santa Cruz Island, the east Santa Barbara Channel, and Cortez and Tanner Banks. Some effort has also been observed around San Clemente Island and San Nicolas Island.

Seasons: This fishery operates year round. Targeted species is typically determined by market demand on a short-term basis.

Gear type and fishing method: Typical gear used for this fishery is a 150-200 fathom gillnet, which is allowed to drift. The mesh size depends on the target species but typical values observed are 6.0 and 6.5 inches.

Regulations: This fishery is managed by the California Dept. of Fish and Game in accordance with state and federal laws.

Management type: This fishery is a limited entry fishery with gear restrictions and area closures.

Comments: This fishery primarily targets white seabass and yellowtail, but also targets barracuda and albacore tuna. ~~For the period May 2001 through July 2003, there were 42 sets observed from 11 vessel trips.~~ From 2002-2004, there have been 66 sets observed from 17 vessel trips. Marine mammal mortalities ~~Observed mortality~~ have included ~~one~~ two ~~short~~ long-beaked common dolphin and ~~2~~ 3 California sea lions. Also, 4 California sea lions were entangled and released alive

[2] K.A. Forney 2004. Estimates of cetacean mortality and injury in two U.S. Pacific longline fisheries, 1994-2002. Southwest Fisheries Science Center Administrative Report LJ-04-07, available from Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037. 17 pp.

during this period. In 2003, there was one coastal bottlenose dolphin stranded with 3.5-inch gillnet wrapped around its tailstock, the responsible fishery is unknown.

Category II, CA swordfish longline fishery

Number of permit holders: ~~About 20-30 vessels based in California participate in the longline fishery.~~ As recently as 2004, there were 20-30 vessels participating in the fishery. Only one vessel was active in 2005. This decline in participation was due to the prohibition in shallow set swordfishing east of W150 longitude.

Number of active permit holders: ~~As of 2002, approximately 20-30 vessels participated in this fishery.~~ In January 2006, there was only one vessel participating in this fishery, which fished for tuna using deep set methods outside the U.S. EEZ. The remaining vessels from this fishery now participate in the Hawaii longline fishery.

Total Effort: An estimated 1 - 1.5 million hooks ~~are~~ were fished annually ~~by~~ when 20-30 California-based vessels participated in the fishery. In 2005, there were only two trips fished by one vessel. Ten sets were observed in the first trip and it is unknown how many sets were made during the second trip because no observer was present.

Geographic range: ~~This fishery operates in west coast waters outside the 200 nm EEZ and unload their catch in California ports.~~ The fishery management plan (FMP) for highly migratory species prohibits targeting swordfish with shallow set fishing methods east of W150 longitude. In March 2006, the Pacific Fishery Management Council approved an application for an exempted fishing permit (EFP) that would allow one vessel to utilize shallow set longline methods within the U.S. EEZ, with the same shallow-set regulations used in the Hawaii fishery (circle hooks and fish bait). An environmental assessment of this proposal will be prepared by the Highly Migratory Species Management Team (HMSMT) for review at a future Council meeting. This EFP would be effective no sooner than 2007 if it receives final approval.

Seasons: The fishery operates year-round.

Gear type: Typically, vessels fish 24-72 km of mainline, rigged with 22 m gangions at approximately 60 m intervals. Anywhere from 800 to 1,300 hooks are deployed in a set, with large squid (Illex sp.) used for bait. Variously colored lightsticks are used, for fishing takes place primarily during the night, when more swordfish are available in surface waters. The mainline is deployed in 4-7 hours and left to drift unattached for 7-10 hours. Retrieval typically takes about 7-10 hours. A description of the gear used for deep sets targeting tuna is given in the Hawaii longline fishery section.

Regulations: Longline vessels are prohibited from operating within the 200 nmi limit, but may unload their catch in California ports and are required to have a California state commercial fishing license.

Management type: The California longline fishery is ~~currently covered by~~ managed under a Highly Migratory Species Fishery Management Plan (FMP) developed by the Pacific Fishery Management Council and NMFS. ~~that was submitted for Secretarial review in November 2003~~. The FMP was partially approved by NMFS on February 4, 2004. NMFS published a final rule on March 11, 2004 which prohibits shallow longline sets of the type normally targeting swordfish on the high seas in the Pacific Ocean east of 150˚ W. longitude. ~~The Pacific Fishery Management Council's Highly Migratory Species (HMS) Management Team is currently investigating scenarios under which swordfish may once again be targeted in this region with the adoption of gear modification measures (circle hooks and mackerel baits) used in the Atlantic that have been shown to significantly reduce takes of loggerhead and leatherback sea turtles. The HMS Management Team is also investigating options to create a limited entry program for this fishery.~~ A mandatory observer program became effective for this fishery in August 2002.

Comments: ~~Many of the vessels in this fishery previously landed in Hawaii, but closures around the Hawaiian Islands have moved fishing effort farther east, and as a result some longline vessels now land in California. Preliminary catch data has been compiled for the California longline fishery from skipper logbooks, dated between August 1, 1995 and December 31, 1999. The logbooks do not report any whale or dolphin interactions, but do show interactions with California sea lions. Other documented bycatch in this fishery includes striped marlin, blue shark, seabirds, and sea turtles (Vojkovich and Barsky, 1998). Since 1993, the number of vessels in this fishery has increased, from 3 to the current estimate of 40-50.~~

~~This increase in vessels initially resulted from the movement of vessels based in the Gulf of Mexico into southern California in the summer of 1993, and more recently from increased effort eastward by vessels originating in Hawaii, responding to a court injunction closing fishing areas around the Hawaiian islands. Approximately 40-50 longline vessels unload in California, and of these, 40 boats originated from Hawaii (and which also have Hawaii longline limited entry permits); these have unloaded their catch in California ports since December, 1999 (D. Petersen, NMFS, personal communication, April, 2000).~~ Between October 2001 and November 2003, 19 trips were observed by California-based longline observers, with 391 sets observed (<15% observer coverage). Between October 2001 and November 2003 the longline observer program~~, there was~~ reported one injured Risso's dolphin and one ~~mortality of an~~ unidentified dolphin ~~observed~~ killed. Examination of photographs of the dead dolphin led marine mammal identification experts to conclude that the animal was most likely a striped dolphin.

Category II, California ~~Round Haul~~ Anchovy, Mackerel, and Tuna Purse Seine Fishery~~ies~~. [3]

~~Note: This category includes purse seine, drum seine and lampara net fisheries for wetfish (anchovy, mackerel, and sardine, and tuna). Choice of targeted species is primarily driven by availability and varying market demand.~~

Number of permit holders: ~~Number of permit holders is estimated at 150 for the wetfish fisheries (currently, tuna does not require a specific permit to operate other than a general commercial fishing permit). Starting January 1, 2000 under a new Coastal Pelagic Species Fishery Management Plan (CPS-FMP), a limited entry program was initiated for the area south of 39° North latitude. Eligibility required a minimum of 100 metric tons of CPS finfish landed between January 1, 1993 through November 5, 1997.~~ There are 63 limited entry permits (Pacific Fishery Management Council. 2005. Status of the Pacific Coast coastal pelagic species fishery and recommended acceptable biological catches. Stocks assessment and fishey evaluation – 2005).

Number of active permit holders: ~~For the wetfish fishery, there are an estimated 65 vessels/persons actively fishing; for tuna, there are approximately 15 vessels/persons fishing.~~ There are 61 vessels actively fishing.

Total effort: ~~An estimated 70 vessels are eligible to fish under the limited entry permit requirements.~~ The fishery is managed under a capacity goal, with gross tonnage of vessels used as a proxy for fishing capacity. Capacity for the fleet is approximately 5,400 gross tons. Harvest guidelines for sardine and mackerel are also set annually.

Geographic range: These fisheries occur along the coast of California predominantly from San Pedro, including the Channel Islands, north to San Francisco.

Seasons: This fishery operates year round. Targeted species vary seasonally with availability and market demand.

Gear type and fishing method: Purse seine, drum seine and lampara nets utilizing standard seining techniques.

Regulations: ~~Starting on January 1, 2000 the wetfish fishery will be managed by PFMC in accordance with a CPS (coastal pelagic species) /FMP (fishery management plan) under federal laws.~~ This is a limited entry fishery.

Management type: ~~The mackerel and sardine fisheries are quota fisheries. Several closures for both mackerel and sardine have been required by NMFS in recent years (mackerel 2001, 2002; sardine 2002, subarea closure) (pers. comm., Dale Sweetnam, California Department of Fish and Game).~~ The fishery is managed under a Coastal Pelagic Species Fisheries Management Plan developed by the Pacific Fishery Management Council and NMFS.

~~Comments: Beginning in 1999 the sardine population is considered fully recovered since its collapse during the middle of the century. Typically, anchovy is targeted for bait or reduction while mackerel and sardine are destined for fresh fish, aquaculture or canning overseas.~~ A NMFS pilot observer program began in July 2004 and has continued through January

[3] Information for this fishery came from the following sources: Pacific Fishery Management Council. 2005. Status of the Pacific Coast coastal pelagic species fishery and recommended acceptable biological catches. Stock assessment and fishery evaluation – 2005; California Coastal Pelagic Species Pilot Observer Program Informational Report 12 October 2005 (NMFS SW Region, unpublished); Lyle Enriquez NMFS Southwest Regional Office (personal communication) and the Marine Mammal Authorization Program, Registration and Reporting System.

2006. A total of 33 sets have been observed with one California sea lion observed killed, five sea lions released alive, and one sea otter released alive. Under the MMAP self-reporting program, the following mortalities have been reported: In 2003, four California sea lions drowned after chewing through a bait barge net used by the anchovy lampara net fishery.

Category II, California Sardine Purse Seine Fishery[3].

Note: This fishery was previously listed as part of the 'CA roundhaul fisheries' in Appendix 1 of the 2005 U.S. Pacific Marine Mammal Stock Assessment Reports. The CA roundhaul fishery category has been divided into the CA anchovy, mackerel, and tuna purse (see above) and CA sardine purse seine fishery, respectively.

Number of permit holders: There are 63 limited entry permits (Pacific Fishery Management Council. 2005. Status of the Pacific Coast coastal pelagic species fishery and recommended acceptable biological catches. Stocks assessment and fishey evaluation – 2005).

Number of active permit holders: There are 61 vessels actively fishing.

Total effort: The fishery is managed under a capacity goal, with gross tonnage of vessels used as a proxy for fishing capacity. Capacity for the fleet is approximately 5,400 gross tons.

Geographic range: These fisheries occur along the coasts of California, Oregon, and Washington.

Seasons: This fishery operates year round. Targeted species vary seasonally with availability and market demand.

Gear type and fishing method: Purse seine, drum seine and lampara nets utilizing standard seining techniques.

Regulations: This is a limited entry fishery.

Management type: The fishery is managed under a Coastal Pelagic Species Fisheries Management Plan developed by the Pacific Fishery Management Council and NMFS.

Comments: A NMFS pilot observer program began in July 2004 and has continued through January 2006. A total of 74 sets have been observed, with 49 California sea lions and one four harbor seals released alive. The following marine mammal mortalities have been reported in this fishery under the MMAP self-reporting program. In 2004, one sea lion drowned during fishing operations in the sardine drum seine fishery.

Category II, WA Puget Sound Region salmon drift gillnet fishery.

Number of permit holders: This commercial fishery includes all inland waters south of the US-Canada border and east of the Bonilla/Tatoosh line, at the entrance to the Strait of Juan de Fuca. Treaty Indian salmon gillnet fishing is not included in this commercial fishery. In 1999, the U.S. and Canada reached an agreement that significantly reduced the U.S. share of sockeye salmon. In order to compensate the non-treaty U.S. fishermen for the impact of this reduction, a federally funded buyback program was established. By the 2001 fishing season, the number of available drift gillnet permits had been reduced from 675 (1999) to 216. The intent of the buyback program was to reduce the number of drift gillnet permits to 200 (pers. comm., David Cantillon, NMFS, Northwest Region).

Number of active permit holders: Under the cooperative program that integrates issuance of Marine Mammal Authorization Certificates into the existing State license process, NMFS receives data on vessels that have completed the licensing process and are eligible to fish. These vessels are a subset of the total permits extant (725 in 2001), and the remainder of the permits are inactive and do not participate in the fishery during a given year. The number of "active" permits is assumed to be equal to or less than the number of permits that are eligible to fish. From 1997-2001, the number of active permits was 633, 559, 199, 248, and 182, respectively.

Total effort: Effort in the Puget Sound salmon drift gillnet fishery is regulated by systematic openings and closures that are specific to area and target salmon species. Since 1994, the number of active vessels in the Puget Sound drift gillnet fishery has declined. In addition, at least one major portion of the fishery, the previously observed sockeye fishery in areas 7 and 7A, has experienced reductions in available fishing time (openings). The number of days and total number of hours that the sockeye fishery remained open, approached the 1994 level only once (1997) in the period from 1995 through 1998. In the remaining years the available sockeye fishing time was less than half of the 1994 level. In recent years, poor sockeye returns and market conditions have combined to reduce participation in the fishery beyond the reductions created originally by the federal buyback program. In 2001, drift gillnets fished for only one opening and 182 gear units were fished in all areas as compared to the 559 cited for 1998. Owing to the buyback program and reduced salmon runs, it is expected that the number of active permits will remain low.

Geographic Range: The fishery occurs in the inland marine waters south of the U.S./Canada border and east of the Bonilla/Tatoosh line at the entrance to the Strait of Juan de Fuca. The inland waters are divided into smaller statistical catch areas which are regulated independently.

Seasons: This fishery has multiple seasons throughout the year that vary among local areas dependent on local salmon runs. The seasons are managed to access harvestable surplus of robust stocks of salmon while minimizing impacts on weak stocks.

Gear type and fishing methods: Vessels operating in this fishery use a drift gillnet of single web construction, not exceeding 300 fathoms in length. Minimum mesh size for gillnet gear varies by target species. Fishing directed at sockeye and pink salmon are limited to gillnet gear with a 5 inch minimum mesh and a 6 inch maximum, with an additional "bird mesh" requirement that the first 20 meshes below the corkline be constructed of 5 inch opaque white mesh for visibility; the chinook season has a 7 inch minimum mesh; the coho season has a 5 inch minimum mesh; and the chum season has a 6 to 6.25 inch minimum mesh. The depth of gillnets can vary depending upon the fishery and the area fished. Normally they range from 180 to 220 meshes in depth, with 180 meshes as a common depth. It is the intention of the fisher to keep the net off the bottom. The vessel is attached to one end of the net and drifts with the net. The entire net is periodically retrieved onto the vessel and catch is removed. Drift times vary depending on fishing area, tidal condition and catch.

Regulations: The fishery is a limited entry fishery with seasonal openings, area closures, and gear restrictions.

Management type: The fishery occurs in State waters and is managed by the Washington Department of Fish and Wildlife consistent with the U.S.-Canada Pacific Salmon Commission management regimes and the ocean salmon management objectives of the Pacific Fishery Management Council. U.S. and Canadian Fraser River sockeye and pink salmon fisheries are managed by the bilateral Fraser Panel in Panel Area waters. This includes the entire U.S. drift gillnet fishery for Fraser sockeye and pink salmon. For U.S. fisheries, Fraser Panel Orders are given effect by federal regulations that consist of In-season Orders issued by the NMFS Regional Administrator of the NMFS Northwest Region. These regulations are filed in the Federal Register post-season.

Comments: In 1993, observers were placed onboard vessels in a pilot program to monitor seabird and marine mammal interactions with fishing effort for several target salmon species in a number of areas throughout the Puget Sound region. In 1994 observer effort was concentrated in the sockeye fishery in areas 7 and 7A, where interactions with seabirds and marine mammals were most likely to occur. Incidental takes of harbor porpoise, Dall's porpoise and harbor seals have been documented in the fishery. The overall take of marine mammals for the salmon drift gillnet fisheries in Puget Sound is unlikely to have increased since the fisheries were last observed, owing to reductions in the number of participating vessels and available fishing time.

Category II, OR swordfish surface longline fishery.

Number of permit holders: ~~The number of Oregon Developmental Fishery Permits for fishing swordfish using a floating longline is limited to 20. The number of permits issued for the period 1998-2002 (through May 2002) were 3, 4, 7, 2, and 3, respectively~~ The number of permits issued annually from 2000-2005 has ranged between one and seven (pers. comm., Jean McCrae, Oregon Department of Fish and Wildlife, Marine Resources Program).

Number of active permit holders: Based on landings of swordfish with this gear type, there were no active permit holders in this fishery from ~~1997-2002~~ 2000-2005.

Total effort: From ~~1997-2002~~ 2000-2005, there were no reported swordfish landings using longline gear.

Geographic range: ~~This fishery occurs off the coast of Oregon. Swordfish longlines may not be fished within 25 nautical miles of the mainland.~~ The Fishery Management Plan prohibits targeting highly migratory species such as swordfish with longlines within the U.S. EEZ, thus any fishing would have to occur outside the EEZ. However, shallow set methods used for swordfish are also prohibited east of W150 longitude.

Seasons: This fishery could occur year-round, however, effort would generally terminate by late fall.

Gear type: Fishing gear consists of a buoyed mainline fitted with leaders and baited hooks. The mainline is fished near the surface suspended from buoys (rather than anchored to the bottom as in groundfish longline fisheries). Swordfish longlines may not exceed 1000 fathoms in length and must be attached at one end to the vessel when fishing. The gear is typically set in the evening and retrieved in the morning.

Regulations: The fishery is a limited entry fishery with gear and bycatch restrictions.

Management type: ~~This fishery is managed by the Oregon Department of Fish and Wildlife, Developmental Fisheries Program.~~ The fishery is managed under a Highly Migratory Species Fisheries Management Plan developed by the Pacific Fishery Management Council and NMFS.

~~Comments: The Developmental Fisheries Permit requires permit holders to take observers aboard if requested to do so, however, to date no observer placements have been made. No marine mammal interactions have been documented.~~

Category II, OR blue shark surface longline fishery.

Number of permit holders: The number of Oregon Developmental Fishery Permits for fishing blue shark using a floating longline is limited to 10. From ~~1997-2002~~2000-2005, there were ~~4,0,0,4,1, and 3~~ fewer than 5 permits issued annually for this fishery (pers. comm., Jean McCrae, Oregon Department of Fish and Wildlife, Marine Resources Program).

Number of active permit holders: There were no active permits in the blue shark longline fishery off Oregon ~~from 1997 through mid-2002~~ from 2000-2005. The effort in this fishery prior to 1998 was estimated to be low based on the number of permits issued and very limited landings.

Total effort: ~~Actual catch by the few developmental permit holders is unknown. Landings of blue shark by all vessels using longline gear totaled 3,628 pounds for the period 1995 through 1998 (477 lbs - '95, 871 lbs - '96, 542 lbs - '97, and 1,738 lbs - '98). Note that these landing totals are for all longline including blue shark landed incidental to the groundfish sunken longline fishery.~~ From 2000-2005, there were no reported landings of blue shark using longline gear.

Geographic range: This fishery occurs off the coast of Oregon. ~~There are no area restrictions for shark longline gear.~~ The Fishery Management Plan prohibits targeting highly migratory species such as blue sharks with longlines within the U.S. EEZ, thus any fishing would have to occur outside the EEZ.

Seasons: This fishery occurs year-round, however, effort in this fishery generally terminates by late fall.

Gear type: Fishing gear consists of a buoyed mainline fitted with leaders and baited hooks. The mainline is fished near the surface suspended from buoys (rather than anchored to the bottom as in groundfish longline fisheries). Shark longlines must be marked at each terminal surface end with a pole and flag, an operating light, a radar reflector, and a buoy showing clear identification and gear owner. The gear is typically set in the evening and retrieved in the morning.

Regulations: The fishery is a limited entry fishery with gear and bycatch restrictions.

Management type: ~~This fishery is managed by the Oregon Department of Fish and Wildlife, Developmental Fisheries Program.~~ The fishery is managed under a Highly Migratory Species Fisheries Management Plan developed by the Pacific Fishery Management Council and NMFS.

~~Comments: The Developmental Fisheries Permit requires permit holders to take observers aboard if requested to do so, however, to date no observer placements have been made. No marine mammal interactions have been documented.~~

Category III, CA herring ~~purse seine~~ gillnet fishery.[4]

~~This fishery is composed of a roe herring fishery and a fresh herring fishery. The sac-roe fishery occurs in California's four largest herring spawning regions: San Francisco Bay, Tomales Bay, Humboldt Bay, and Crescent City Harbor.~~ The herring fishery is concentrated in four spawning areas which are managed separately by the California Department of Fish and Game (CDFG); catch quotas are based on population estimates derived from acoustic and spawning-ground surveys. The largest spawning aggregations occur in San Francisco Bay and produces more than 90% of the herring catch. Smaller spawning aggregations are fished in Tomales Bay, Humboldt Bay, and Crescent City Harbor. ~~The roe herring component has recently undergone some changes.~~ During the early 1990's, there were 26 round haul permits ~~fishing for roe herring using~~ (either purse seine or lampara nets). Between 1993 and 1998, all ~~roe herring~~ purse seine fishers converted their gear to gillnets with stretched mesh size less than 2.5 inches (which are not known to take mammals) as part of CDFG efforts to protect herring resources. The ~~sac-roe~~ fishery is managed through a limited-entry program. ~~Since 19+-83, only five new permits have been issued, and the number of annual permits has remained at about 450.~~ The California Department of Fish and Game website lists a total of 447 herring gillnet permits for 2005 (http://www.dfg.ca.gov/mrd/herring/index.html). Of these, 406 permits exist for San Francisco Bay, 34 in Tomales Bay, 4 in Humboldt Bay, and 3 in Crescent City Harbor. This fishery begins in December (San Francisco Bay) or January (northern California) and ends when the quotas have been reached, but no later than mid-March. ~~There are 10 permits available for the fresh herring round haul fishery (purse seine or lampara nets). This fishery is restricted to the non-spawning season, or approximately mid-March through the end of November. Fishing may take place in open ocean areas (e.g. Monterey Bay) or inside bays (e.g. San Francisco Bay).~~

Category II, CA squid purse seine fishery.[5]

Number of permit holders: A permit to participate in the squid fishery has been required since April 1998. There are two types of permits. Market squid vessel permits allow a light vessel to attract squid with lights and catch squid. Light boat owner permits only allow the use of attracting lights to aggregate market squid. In the 2002/2003 season there were 184 market squid vessel permits and 40 light boat owner permits issued. Landings of two tons or less are considered incidental and no permit is required.

Number of active permit holders: The number of active permits varies by year depending on market conditions and squid availability. During the 2002/2003 season, there were approximately 105 vessels active during some portion of the year. Thirty-four vessels harvested 90% of the total landings greater than two tons. The 1999/2000 season had the highest squid landings to date, with 132 vessels making squid landings greater than two tons.

Total effort: Beginning in May 2000, logbooks were required for the squid fishery. Results for the 2001 calendar year indicate that each hour of fishing required 5.5 hours of search time by light boats. Combined searching and fishing effort resulted in 3.7 mt of catch per hour. In the 2002/2003 season, the fishery made 2,244 landings. This is a 34.0% decrease from the previous season. In addition, the average landing decreased from 28.2 mt to 19.0 mt.

Geographic range: Since the mid-1980s, the majority of the squid fishing harvest has occurred south of Point Conception. However, during the 2002/2003 season, a moderate El Nino condition resulted in nearly 60% of the catch landed in northern California. The northern fishery harvest ranged from Morro Bay to Fort Bragg, although the majority of fishing occurred within a half mile of the Monterey Bay shoreline. The Monterey Bay fishery has been in operation since the mid-

[4] Pers. Comm. Becky Ota, State Herring Manager, Senior Biologist.

[5] This fishery description was provided by Dale Sweetnam, Senior Biologist at CDFG La Jolla.

1800s and has historical significance for California. Squid catch south of Point Conception accounted for only 41% of the 2002/2003 landings and declined 54% from 84,024 mt in the previous season to 17,387 mt.

Seasons: This fishery occurs year-round, however, effort in this fishery differs north and south of Point Conception. Typically, the fishery north of Point Conception operates from April through September while the southern fishery is most active from October through March. El Niño conditions hamper the fishery and squid landings are minimal during these events, while landings in the northern fishery often increase. The La Niña event in 1999 resulted in the southern fishery landing squid year-round.

Gear type: There are several gears employed in this fishery. From 1997-2001, the vast majority (98%) of vessels uses either purse (77%) or drum (21%) seine nets. Other types of nets used include lampara, dip and brail nets which are used by a few vessels in southern California. Another gear type associated with the market squid fishery is attracting lights that are used to aggregate spawning squid. In 2000, attracting lights were regulated and each vessel is now restricted to no more than 30,000 watts of lights during fishing activities. Further, to reduce light scatter, lights must be shielded and oriented directly downward. The lighting restrictions were enacted to avoid risks to nesting brown pelicans and interactions with other seabird species of concern.

Regulations: All vessels participating in the squid fishery must have a permit. Commercial squid fishing is prohibited between noon on Friday and noon on Sunday of each week to allow a two-day consecutive uninterrupted period of spawning. A mandatory logbook program for fishing and lighting vessels has been in place since May 2000. In May 2001, a seasonal harvest guideline of 125,000 short tons for market squid was established to limit further expansion of the fishery.

Management type: This fishery was largely unregulated until 1998 when it came under more strict regulatory control by the Department of Fish and Game. The fishery is considered a monitored fishery in the Pacific Fishery Management Council's Coastal Pelagic Species Fishery Management Plan. A state fishery management plan is to be adopted by the Fish and Game Commission by December 2004. The plan considers seasonal and daily catch limitations; weekend closures, research and monitoring programs, harvest replenishment areas, live bait and incidental market squid catch, restricted access programs including transferability, gear restrictions, area and time closures to address seabird issues, and permit fees.

Comments: The squid fishery operates primarily at night and targets spawning aggregations with the use of lights. Encounters between the fishery and pilot whales, pinnipeds, dolphins, and birds have been documented. Seal bombs are used regularly. A pilot observer program began in July 2004 and has documented one unidentified common dolphin mortality in 135 sets through January 2006. In addition, there have been 96 California sea lions and three harbor seals released alive (NMFS, Southwest Region, unpublished data). In addition to these observed mortalities, there were three strandings of Risso's dolphin from 2002-2003 where evidence of gunshot wounds was confirmed, suggesting interaction with this fishery (NMFS Southwest Regional Office, unpublished data). Lethal and nonlethal interaction rates are unknown. During the 1980s, California's squid fishery grew rapidly in fleet size and landings when international demand for squid increased due to declining squid fisheries in other parts of the world. In 1997, the rapid growth of fleet size was halted by a moratorium on new permits. Landing records were set several times during the 1990s, but have been curtailed with the establishment of the 125,000 short ton seasonal harvest guideline.

Category III, WA Willapa Bay salmon drift gillnet fishery.

Number of permit holders: The total number of permit holders for this fishery in 1995 and 1996 was 300 but this number has declined in subsequent years. In 1997 there were 264 total permits and 243 in 1998. The NMFS 2001 List of Fisheries lists an estimate of 82 vessels/persons in this fishery.

Number of active permit holders: The number of active permit holders is assumed to be equal to or less than the number of permits eligible to fish in a given year. The number of permits renewed and eligible to fish in 1996 was 300 but declined to 224 in 1997 and 196 permits were renewed for 1998. The 1996-98 counts do not include permits held on waivers for those years, but do include permits that were eligible to fish at some point during the year and subsequently entered into a buyback program. The number of permits issued for this fishery has been reduced through a combination of State and federal permit buyback programs. Vessels permitted to fish in the Willapa Bay are also permitted to fish in the lower Columbia River drift gillnet fishery.

Total effort: Effort in this fishery is regulated through area and species openings. The fishery was observed in 1992 and 1993 when fishery opening were greater than in recent years. In 1992 and 1993 there were 42 and 19 days of open fishing time during the summer "dip-in" fishery. The "dip-in" fishery was closed in 1994 through 1999. Available openings have also declined in the fall chinook/coho fisheries. In 1992/93 respectively there were 44 and 78 days of available fishing time. There were 43, 45, 22 and 16.5 available open fishing days during 1995 through 1998.

Geographic range: This fishery includes all inland marine waters of Willapa Bay. The waters of the Bay are further divided into smaller statistical catch areas.

Seasons: Seasonal openings coincide with local salmon run timing and fish abundance.

Gear type: Fishing gear used in this fishery is a drift gillnet of single web construction, not exceeding 250 fathoms in length, with a minimum stretched mesh size ranging upward from 5 inches depending on target salmon species. The gear is commonly set during periods of low and high slack tides. It is the intention of the fisher to keep the net off the bottom. The vessel is attached to one end of the net and drifts with the net. The entire net is periodically retrieved onto the vessel and catch is removed. Drift times vary depending on fishing area, tidal condition, and catch.

Regulations: This fishery is a limited entry fishery with seasonal openings and gear restrictions.

Management type: The salmon drift gillnet fishery is managed by the Washington Department of Fish and Wildlife.

Comments: Observers were placed onboard vessels in this fishery to monitor marine mammal interactions in the early 1980s and in 1990-93. Five incidentally taken harbor seals were recovered by observers in the fishery from 1991through 1993 (3 in ‘92 and 2 in ‘93). Two incidentally taken northern elephant seals were recovered by observers from the fishery in 1991 but no takes of this species were observed. The summer fishery (July- August) in Willapa Bay has been closed since it was last observed in 1993 and available fishing time declined from 1996 through 1998.

Category III, WA Grays Harbor salmon drift gillnet fishery.

Number of permit holders: This commercial drift gillnet fishery does not include Treaty Indian salmon gillnet fishing. The total number of permit holders for this commercial fishery in 1995 and 1996 was 117 but this number has declined in subsequent years. In 1997 there were 101 total permits and 87 in 1998.

Number of active permit holders: The NMFS 2001 List of Fisheries lists a total of 24 vessels/persons operating in this fishery. The number of active permit holders is assumed to be equal to or less than the number of permits eligible to fish in a given year. The number of permits renewed and eligible to fish in 1996 was 117 but declined to 79 in 1997 and 59 permits were renewed for 1998. The 1996-98 counts do not include permits held on waivers for those years but do include permits that were eligible to fish at some point during the year and subsequently entered a buyback program. The number of permits issued for this fishery has been reduced through a combination of State and federal permit buyback programs. Vessels permitted to fish in Grays Harbor are also permitted to fish in the lower Columbia River salmon drift gillnet fishery.

Total effort: Effort in this fishery is regulated through area and species openings. The fishery was observed in 1992 and 1993 when fishery openings were greater than in recent years. In 1992 and 1993 there were 42 and 19 days of open fishing time during the summer "dip-in" fishery. The "dip-in" fishery was closed in 1994 through 1999. Available openings have also declined in the fall chinook/coho fisheries. There were 11, 17.5, 9 and 5 available open fishing days during the 1995 through 1998 fall season.

Geographic range: Effort in this fishery includes all marine waters of Grays Harbor. The waters are further divided into smaller statistical catch areas.

Seasons: This fishery is subject to seasonal openings which coincide with local salmon run timing and fish abundance.

Gear type: Fishing gear used in this fishery is a drift gillnet of single web construction, not exceeding 250 fathoms in length, with a minimum stretched mesh size ranging of 5 inches depending on target salmon species. The gear is commonly set during periods of low and high slack tides and retrieved periodically by the tending vessel. It is the intention of the fisher to keep the net off the bottom. The vessel is attached to one end of the net and drifts with the net. The entire net is periodically retrieved onto the vessel and catch is removed. Drift times vary depending on fishing area, tidal condition, and catch.

Regulations: The fishery is a limited entry fishery with seasonal openings and gear restrictions.

Management type: The salmon drift gillnet fishery is managed by the Washington Department of Fish and Wildlife.

Comments: Observers were placed onboard vessels in this fishery to monitor marine mammal interactions in the early 1980s and in 1990-93. Incidental take of harbor seals was observed during the fishery in 1992 and 1993. In 1992, one harbor seal was observed entangled dead during the summer fishery and one additional seal was observed entangled during the fall fishery but it escaped uninjured. In 1993, one harbor seal was observed entangled dead and one additional seal was recovered by observers during the summer fishery. The summer fishery (July-August) in Grays Harbor has been closed since it was last observed in 1993. Available fishing time in the fall chinook fisheries declined from 1996 through 1998.

Category III, WA, OR lower Columbia River salmon drift gillnet fishery.

Number of permit holders: The total number of permit holders was 856 (344 from Oregon and 512 from Washington) when the fishery was last observed in 1993. In 1995 through 1998 the number of permits was 747, 693, 675 and 620 respectively. The number of permits issued for this fishery by Washington has been reduced through a combination of State and federal buy-back programs. This reduction is reflected in the overall decline in the total number of permits.

Number of active permit holders: The number of active permits is a subset of the total permits issued for the fishery. For example, in 1995, 110 vessels (of the 747 vessels holding permits) landed fish in the mainstem fishery.

Total effort: Effort in this fishery is regulated through species related seasonal openings and gear restrictions. The fishery was observed in 1991, 1992 and 1993 during several seasons of the year. The winter seasons (openings) for 1991 through 1993 totaled 13, 9.5, and 6 days respectively. The winter season has subsequently been reduced to remnant levels to protect upriver ESA listed salmon stocks. In 1995 there was no winter salmon season, in 1996 the fishery was open for 1 day. In 1997 and 1998 the season was shifted to earlier in the year and gear restrictions were imposed to target primarily sturgeon. The fall fishery in the mainstem was also observed 1992 and 1993 as was the Young's Bay terminal fishery in 1993, however, no marine mammal mortalities were observed during these fisheries. The fall mainstem fishery openings varied from 1 day in 1995 to just under 19.5 days in 1997 and 6 days in 1998. The fall Youngs Bay terminal fishery fluctuated between 60 and 70 days for the 1995 through 1998 period which was similar to the fishery during the period observed.

Geographic range: This fishery occurs in the main stem of the Columbia river from the mouth at the Pacific Ocean upstream to river mile 140 near the Bonneville Dam. The lower Columbia is further subdivided into smaller statistical catch areas which can be regulated independently.

Seasons: This fishery is subject to season and statistical area openings which are designed to coincide with run timing of harvestable salmon runs while protecting weak salmon stocks and those listed under the Endangered Species Act. In recent years, early spring (winter) fisheries have been sharply curtailed for the protection of listed salmon species. In 1994, for example, the spring fishery was open for only three days with approximately 1900 fish landed. In 1995 the spring fishery was closed and in 1996 the fishery was open for one day but fishing effort was minimal owing to severe flooding. Only 100 fish were landed during the one day in 1996.

Gear type: Typical gear used in this fishery is a gillnet of single web construction, not exceeding 250 fathoms in length, with a minimum stretched mesh size ranging upwards from 5 inches depending on target salmon species. The gear is commonly set during periods of low and high slack tides. It is the intention of the fisher to keep the net off the bottom.

The vessel is attached to one end of the net and drifts with the net. The entire net is periodically retrieved onto the vessel and catch is removed. Drift times vary depending on fishing area, tidal condition, and catch.

Regulations: The fishery is a limited entry fishery with seasonal openings, area closures, and gear restrictions.

Management type: The lower Columbia River salmon drift gillnet fishery is managed jointly by the Washington Department of Fish and Wildlife and the Oregon Department of Fish and Wildlife.

Comments: Observers were placed onboard vessels in this fishery to monitor marine mammal interactions in the early 1980s and in 1990-93. Incidental takes of harbor seal and California sea lion were documented, but only during the winter seasons (which have been reduced dramatically in recent years to protect ESA listed salmon). No mortalities were observed during the fall fisheries.

Category III, WA, OR salmon net pens.

Number of permit holders: There were 12 commercial salmon net pen ("grow out") facilities licensed in Washington in 1998. There are no commercial salmon net pen or aquaculture facilities currently licensed in Oregon. Non-commercial salmon enhancement pens are not included in the list of commercial fisheries.

Number of active permit holders: Twelve salmon net pen facilities in Washington.

Total effort: The 12 licensed facilities on Washington operate year-round.

Geographic range: In Washington, net pens are found in protected waters in the Straits (Port Angeles), northern Puget Sound (in the San Juan Island area) as well as in Puget Sound south of Admirality Inlet. There are currently no commercial salmon pens in Oregon.

Seasons: Salmon net pens operate year-round.

Gear type: Net pens are large net impoundments suspended below a floating dock-like structure. The floating docks are anchored to the bottom and may also support guard (predator) net systems. Multiple pens are commonly rafted together and the entire facility is positioned in an area with adequate tidal flow to maintain water quality.

Regulations: Specific regulations unknown.

Management type: In Washington, the salmon net pen fishery is managed by the Washington Department of Natural Resources through Aquatic Lands Permits as well as the Washington Department of Fish and Wildlife.

Comments: Salmon net pen operations have not been monitored by NMFS for marine mammal interactions, however, incidental takes of California sea lions and harbor seals have been reported.

Category III, WA, OR, CA groundfish trawl.

Approximate number of vessels/persons: In 1998, approximately 332 vessels used bottom and mid-water trawl gear to harvest Pacific coast groundfish. This is down from 383 vessels in 1995. The NMFS List of Fisheries for 2001 lists 585 vessels as participating in this fishery. Groundfish trawl vessels harvest a variety of species including Pacific hake, flatfish, sablefish, lingcod, and rockfish. This commercial fishery does not include Treaty Indian fishing for groundfish.

All observed incidental marine mammal takes have occurred in the mid-water trawl fishery for Pacific hake. The annual hake allocation is divided between vessels that harvest and process catch at sea and those that harvest and deliver catch to shore-based processing facilities. At least one NMFS-trained observer is placed on board each at-sea processing vessel to provide comprehensive data on total catch, including marine mammal takes. In the California, Oregon, and Washington range of the fishery, the number of vessels fishing ranged between 12 and 16 (all with observers) during 1997-2001. Hake vessels that deliver to shore-based processors are issued Exempted Fishing Permits that requires the entire catch to be delivered unsorted to processing facilities where State technicians have the opportunity to sample. In 1998, 13% of the hake deliveries landed at shore-based processors were monitored. The following is a description of the commercial hake fishery.

Number of permit holders/active permit holders: A license limitation ("limited entry") program has been in effect in the Pacific coast groundfish fishery since 1994. The number of limited entry permits is limited to 404. Non-tribal trawl vessels that harvest groundfish are required to possess a limited entry permit to operate in the fishery. Any vessel with a federal limited entry trawl permit may fish for hake, but the number of vessels that do is smaller than the number of permits. In 1998, approximately 61 limited entry vessels, 7 catcher/processors and 50 catcher vessels delivering to shoreside and mothership processors, made commercial landings of hake during the regular season. In addition, 6 unpermitted mothership processors received unsorted hake catch.

Total effort: The hake allocation continues to be fully utilized. From 1997 to 1999 the annual allocation was 232,000 mt/year, this is an increase over the 1996 allocation of 212,000 mt and the 1995 allocation of 178,400 mt. In 1998, motherships vessels received 50,087 mt of hake in 17 days, catcher/processors took 70,365 mt of hake in 54 days and shore-based processors received 87,862 mt of hake over a 196 day period.

Geographic range: The fishery extends from northern California (about 40^{o} 30' N. latitude) to the U.S.-Canada border. Pacific hake migrate from south to north during the fishing season, so effort in the south usually occurs earlier than in the north.

Seasons: From 1997 to 1999, season start dates have remained unchanged. The shore-based season in most of the Eureka area (between 42^{O}- 40^{O}30' N latitude) began on April 1, the fishery south of 40^{O}30' N latitude opened April 15, and the fishery north of 42^{O} N latitude started on June 15. In 1998, the primary season for the shore-based fleet closed on October 13, 1998. The primary seasons for the mothership and catcher/processor sectors began May 15, north of 42^{0} N. lat. In 1998, the mothership fishery closed on May 31, the catcher/processor fishery closed on August 7.

Gear type: The Pacific hake trawl fishery is conducted with mid-water trawl gear with a minimum mesh size of 3 inches throughout the net.

Regulations/Management type: This fishery is managed through federal regulations by the Pacific Fishery Management Council under the Groundfish Fishery Management Plan.

Comments: Since 1991, incidental takes of Steller sea lions, Pacific white-sided dolphin, Dall's porpoise, California sea lion, harbor seal, northern fur seal, and northern elephant seal have been documented in the hake fishery. From 1997-2001, 4 California sea lions, 2 harbor seals, 2 northern elephant seals, 1 Pacific white-sided dolphin, and 6 Dall's porpoise were reported taken in California/Oregon/Washington regions by this fishery.

Category III, Hawaii gillnet fishery.[6]

Number of active permit holders: In 1997 there were 129 active commercial fishers. In 1995 there were approximately 115.

Total effort: In 1997 there were 2,109 trips for a total catch of 864,194 pounds with 792,210 pounds sold. This fishery operates in nearshore and coastal pelagic regions.

Seasons: This fishery operates year-round with the exception of Juvenile big-eyed scad less than 8.5 inches which cannot be taken from July through October.

[6]Descriptions of Hawaii State managed fisheries provided by William Devick, State of Hawaii, Department of Land and Natural Resources, Division of Aquatic Resources, Honolulu Hawaii.

Gear type: Gillnets of stretched mesh greater than 2 inches and stretched mesh size greater than 2.75 inches for stationary gillnets. Stationary nets must be inspected every 2 hours and total soak time cannot exceed four hours in the same location. New restrictions implemented in 2002 include that nets may not: 1) be used more than once in a 24-hour period; 2) exceed a 12 ft stretched height limit; 3) exceed a single-panel; 4) be used at night; 5) be set within 100 ft. of another lay net; 6) be set in more than 80 ft depths; 7) be left unattended for more than ½ hour; 8) break coral during retrieval and nets must be 1) registered with the Division of Aquatic Resources; 2) inspected within two hours after being set; 2) tagged with two marker buoys while fished. In addition to these gear restrictions, non-commercial users of lay nets may not use a net longer than 500 ft, while commercial users may use nets up to 1200 ft in length. Additional mesh restrictions are in place for taking the big-eyed scad.

Regulations: Gear and season restrictions (see above).

Management type: Managed by the State of Hawaii Division of Aquatic Resources.

Comments: The principle catches include reef fishes and big-eyed scad (akule) and mackerel scad (opelu). Interactions have been documented with bottlenose dolphin and spinner dolphin.

Category III, Hawaii lobster trap fishery.[7 8]

Note: The portion of this fishery managed by the State of Hawaii and operating in the MHI is about 1% of the size (total pounds of lobster caught) of the federally managed fishery operating primarily in the NWHI. The description that follows refers to the NWHI fishery unless stated otherwise.

Number of permit holders: There are 15 permit holders under a (1991) federal limited access program.

Number of active permit holders: In 1998 and 1999 there were 5 and 6 vessels that participated respectively. In the MHI there were 5 active fishers in 1997.

Total effort: The number of trap hauls for 1999 is not available at this time. However, the majority of the effort took place in the 4 harvest guideline areas; Necker Bank, Gardner Pinnacles and Maro Reef, with the remaining effort spread out over 10 unique areas. In 1998 171,000 trap hauls were made by the 5 vessels during 9 trips and in 1997 a total of 177,700 hauls were made. In the MHI 19 trips were made in 1997.

Geographic range: Lobster permits allow fishing operations in the US EEZ from 3 to 200 nmi offshore American Samoa, Guam and Hawaii (including the EEZ areas of the NWHI and MHI). However, no vessels have operated in the EEZ's of American Samoa or Guam since 1983.

Seasons: This fishery operates under a seasonal harvest guideline system opening on July 1. The season ends once the harvest guideline is met, but no later than December 31. In 1998, the harvest guideline was divided into the 4 areas mentioned above with total lobster catch set at (in thousands) 70, 20, 80, and 116, respectively. Area closure occurs once an area's harvest guideline is met. In the MHI, open season is from September through April.

Gear type: One string consists of approximately 100 Fathom-plus plastic lobster traps. About 10 such strings are pulled and set each day. Since 1987 escape vents that allow small lobsters to escape from the trap have been mandatory. In 1996, the fishery became "retain all", i.e. there are no size limits or prohibitions on the retention of berried female lobsters. The entry-way of the lobster trap must be less than 6.5 inches to prevent monk seals from getting their heads stuck in the trap. In the MHI, rigid trap materials must have a dimension greater than 1 inch by 2 inches, with the trap not exceeding 10 feet by six feet.

[7] Kawamoto, K. and Samuel G. Pooley. 1999. Draft Annual report of the 1998 western pacific lobster fishery.
[8] Kawamoto, K. 1999. Summary of the 1999 NWHI Lobster Fishing Season. NMFS Honolulu Laboratory.

Regulations: Season, gear and quota restrictions (see above) for the NWHI were formulated by the Western Pacific Regional Fishery Management Council and implemented by NMFS. The MHI fishery is managed by the State of Hawaii, Division of Aquatic Resources with season and gear restrictions (see above).

Management type: Limited access program with bank specific quotas and closures. In the MHI, open access.

Comments: The NWHI fishery targets the red spiny lobster and the common slipper lobster. The ridgeback slipper lobster is also taken. Protected species of concern include monk seals (mentioned above) and turtles. There have been no interactions with these species since 1995 but they have been seen in the vicinity of the fishing gear.

Category III, Hawaii inshore handline fishery.

In 1997 a total 750 fishers made 8,526 fishing trips in the main Hawaiian Islands and caught 531,449 pounds and sold 475,562 pounds for an ex-vessel landing value of $1,010,758. This fishery occurs in nearshore and coastal pelagic regions. The principal catches include reef fishes and big-eyed scad (akule) and mackerel scad (opelu). In 1995 approximately 650 fishers were active. Interactions have been documented for bottlenose dolphin.

Category III, Hawaii deep sea bottomfish handline and jig fishery.

Note: There are two commercial bottomfish fisheries in Hawaii: a distant water Northwestern Hawaiian Islands (NWHI) limited entry fishery under federal jurisdiction and the main Hawaiian Islands bottomfish fishery primarily under the State of Hawaii jurisdiction.

Number of permit holders: The main Hawaiian Islands fishery is open access with close to 2,000 bottomfish vessels registered with the State of Hawaii, whereas the NWHI is restricted to a maximum of 17 vessels.

Number of active permit holders: In 1997 in the MHI a total of 750 fishers were active. The NWHI are divided into the Mau Zone (closer to MHI) and the Hoomalu Zone. The Hoomalu Zone is a limited entry zone with 6 vessels participating in 1998, 7 vessels fished the Mau Zone in the same year. Restrictions on new entry into the Mau Zone were implemented in 1998.

Total effort: In 1998 in the MHI approximately 8,500 trips were made with a total catch of 424,000 pounds for an ex-vessel landing value of $1,336,000. This fishery occurs primarily in offshore banks and pinnacles. In the NWHI 332,000 pounds ($894,000) were caught in 1998, below average since 1990.

Seasons: Year round.

Gear type: This fishery is a hook-and-line fishery that takes place in deep water. In the NWHI fishery, vessels are 30 ft or greater and conduct trips of about 10 days. In the MHI the vessels are smaller than 30 ft and trips last from 1 to 3 days.

Regulations: In the MHI, the sale of snappers (opakapaka, onaga and uku) and jacks less than one pound is prohibited. In June of 1998, Hawaii Division of Aquatic Resources (HDAR) closed 19 areas to bottomfishing and regulations pertaining to seven species (onaga, opakapaka, ehu, kalekale, gindai, hapuupuu and lehi) were enacted.

Management type: The MHI is managed by the HDAR with catch, gear and area restrictions (see above) but no permit limits. The NWHI is a limited access federal program.

Comments: The deep-slope bottomfish fishery in Hawaii concentrates on species of eteline snappers, carangids, and a single species of grouper concentrated at depths of 30-150 fathoms. These fish have been fished on a subsistence basis since ancient times and commercially for at least 90 years. NMFS is considering the possibility of re-categorizing the NWHI bottomfish fishery from Category III to Category II due to concerns for potential interactions between bottomfish fishing vessels and Hawaiian monk seals, although there were none observed during 26 NWHI bottomfish trips during 1990-1993, and none reported. On 12 of the 26 trips, bottlenose dolphins have been observed stealing fish from the lines, but not hookings or entanglements occurred. Effort in this fishery increases significantly around the Christmas season because a target species, a true snapper, is typically sought for cultural festivities.[11] No data is collected for recreational or subsistence fishermen, but their MHI catch is estimated to be about equal to the MHI commercial catch.

Category III, Hawaii tuna handline and jig fishery.

In 1997 a total of 543 fishers made 6,627 trips in the MHI and caught 2,014,656 pounds and sold 1,958,759 pounds for an ex-vessel value of $3,788,391. This fishery occurs around offshore fish aggregating devices and mid-ocean seamounts and pinnacles. The principal catches are small to medium sized bigeye, yellowfin and albacore tuna. There are several types of handline methods in the Hawaiian fisheries. Baited lines with chum are used in day fishing operations (palu-ahi), another version uses squid as bait during night operations (ika-shibi), and an operation called “danglers” uses multiple lines with artificial lures suspended or dangled over the water. Interactions have been documented for rough-toothed dolphin, bottlenose dolphin, and Hawaiian monk seal.

Table 1. The number of animals injured and/or killed reported to the Marine Mammal Authorization Program (MMAP) compared with data reported from the NMFS Observer Program for the California large mesh drift gillnet swordfish fishery between 2000-2004. The drift gillnet fishery had 20% observer coverage during this period.

	2000		2001		2002		2003		2004	
	MMAP	NMFS	MMAP	NMFS	MMAP	NMFS	MMAP	NMFS	MMAP	NMFS
Species										
Gray whale	-	-	-	-	-	-	-	-	-	-
Humpback whale	-	-	-	-	-	-	-	-	-	1
Short-finned pilot whale	-	-	-	-	-	-	-	1	-	-
Pacific white-sided dolphin	11	2	-	2	-	1	-	-	-	-
Bottlenose dolphin	-	-	1		-	-	-	-	-	-
Common dolphin spp.	17	25	7	7	4	11	7	17	3	7
Risso's dolphin	2	-	-	-	-	-	-	4	-	-
Northern right whale dolphin	4	-	1	5	2	2	0	1	1	1
Unidentified small cetacean	2	-	4	-	2	-	2	-	-	-
California sea lion	13	13	3	2	16	18	4	4	1	7
Steller's sea lion	-	-	-	-	-	-	-	-	1	-
Northern elephant seal	2	6	-	1	-	1	-	1	-	-
Unidentified seal	1	-	-	-	-	-	-	-	-	-
Unidentified sea lion	-	-	-	-	1	-	-	-	-	-
Unidentified baleen whale	-	-	-	-	-	-	-	1	-	-
Total Occurrences Reported	52	46	16	17	25	33	13	29	6	16

Table 2. Strandings reported to the NMFS Marine Mammal Stranding Network 2000-2004. hr = human-related strandings.

Species	2000				2001				2002				2003				2004			
	CA	hr	OR/WA	hr	CA	hr	OR/WA	hr	CA	hr	OR/WA	hr	CA	hr	OR/WA	hr	CA	hr	OR/WA	hr
Harbor Porpoise	20	2	6	1	12	4	15	1	20	5	0	0	19	0	34	1	39	3	23	0
Dall's Porpoise	3	0	9	1	2	1	6	0	3	0	0	0	4	1	6	0	4	0	14	0
Pac. White-sided Dolphin	3	0	0	0	6	2	0	0	1	0	1	0	1	0	1	0	6	1	1	0
Risso's Dolphin	6	0	1	0	3	0	0	0	4	2	0	0	5	1	0	0	5	0	0	0
Bottlenose Dolphin	12	0	0	0	14	0	0	0	12	0	0	0	9	1	0	0	13	1	1	0
Common Dolphin (unidentified)	30	1	0	0	33	3	0	0	41	1	0	0	56	1	0	0	11	0	0	0
Short-beaked common dolphin	0	0	0	0	0	0	0	0	8	0	0	0	10	0	0	0	9	1	0	0
Long-beaked common dolphin	0	0	0	0	0	1	0	0	45	3	0	0	62	3	0	0	20	4	0	0
Striped Dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0
N. Right Whale Dolphin	0	0	0	0	5	0	0	0	1	0	0	0	4	0	0	0	2	0	1	0
Rough-toothed Dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer Whale	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Short-finned Pilot Whale	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Baird's Beaked Whale	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	1	0	0	0
Stejneger's Beaked Whale	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Cuvier's Beaked Whale	1	0	0	0	0	0	1	1	3	0	0	0	0	0	0	0	0	0	0	0
Peruvian Beaked Whale	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident. Beaked Whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Unidentified Kogia	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Pygmy Sperm Whale	0	0	0	0	1	0	0	0	3	1	0	0	1	0	0	0	1	0	0	0
Dwarf Sperm Whale	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm Whale	0	0	1	0	0	0	0	0	0	0	2	0	2	0	1	0	2	1	1	0
Gray Whale	58	8	25	0	5	1	1	0	7	3	1	1	8	3	5	1	18	3	6	2
Minke Whale	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	1	0
Blue Whale	0	0	0	0	0	0	0	0	3	1	0	0	1	1	0	0	2	1	0	0
Fin Whale	0	0	0	0	1	1	0	0	0	0	4	4	2	0	0	0	3	1	0	0
Sei Whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Humpback Whale	4	3	0	0	2	1	0	0	1	0	0	0	2	5	0	0	4	1	1	0
Unidentified Cetacean	1	0	4	1	0	0	0	0	3	0	1	0	6	0	0	0	2	0	3	0
Unidentified Porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0
Unidentified Dolphin	11	0	2	0	9	0	2	0	29	1	0	0	17	0	2	0	14	0	0	0
Unidentified Whale	1	0	0	0	4	4	0	0	2	2	0	0	1	0	1	0	7	6	0	0
Unident. Balaenopterid	0	0	0	0	2	0	0	0	2	1	0	0	0	0	0	0	0	0	3	0
Northern Fur Seal	3	0	6	0	2	0	1	1	11	0	0	0	5	0	3	2	9	0	0	0
Guadalupe Fur Seal	1	0	0	0	3	1	0	0	1	0	0	0	5	0	0	0	7	1	0	0
Steller (Nthn) Sea Lion	10	2	5	0	9	0	4	0	6	0	3	0	9	0	16	0	7	1	20	0
California Sea Lion	1268	67	32	5	990	98	27	1	1951	195	8	0	2951	184	51	4	1563	109	125	12
Unidentified Sea Lion	1	0	8	0	0	0	17	0	1	0	0	0	0	0	16	1	0	0	18	0
Unidentified Otariid	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0
Harbor Seal	230	13	148	8	152	8	170	8	163	18	121	6	211	18	211	7	185	14	325	18
Northern Elephant Seal	211	3	11	0	216	4	11	0	176	7	0	0	299	5	6	0	270	3	8	0
Unidentified Seal	0	0	17	1	0	0	11	1	1	0	0	0	0	0	0	0	0	0	2	0
Unidentified Pinniped	133	0	8	0	110	0	9	0	291	0	4	0	136	0	45	2	99	1	49	0
Totals for Cetaceans	152	14	48	3	101	18	28	2	189	20	10	5	212	16	58	4	165	23	59	2
Totals for Pinnipeds	1857	85	235	14	1482	111	250	11	2603	220	136	6	3617	207	348	16	2140	129	547	30

Table 3. Characteristics of Category I and Category II gillnet fisheries in California.

Fishery	Species	Mesh Size	Water Depth	Set Duration	Deployment	Miscellaneous
Category I CA/OR thresher shark/swordfish drift gillnet fishery	swordfish/shark	14 to 22 inches	Ranges from 90 to 4600 meters	Typically 8 to 15 hrs	Drift net only	Nets 500 to 1800 meters in length; other species caught: opah, louver, tuna, thresher, blue shark, mako shark
Category I CA angel shark/halibut and other species set gillnet fishery (>3.5 inch mesh)	Halibut/angel shark	8.5 inch	< 70 meters	24 hrs	Set net	
	Barracuda	3.5 inch		< 12 hrs	Drift net	April – July
	Leopard Shark	7.0 to 9.0 inch	< 90 meters			Fished similar to halibut.
	Perch/Croaker	3.5 to 4.0 inch	< 40 meters	< 24 hrs	Set net	Few boats target these species
	Rockfish	4.5 to 7.5 inch	> 90 meters	12 to 18 hrs	Set net	Net lengths 450 to 1800 meters. Soupfin shark is major bycatch.
	Soupfin shark	6.0 to 8.5 inch	> 50 meters	24 hrs	Set net	Few boats target this species.
	Miscellaneous shark	6.0 to 14 inch	< 70 meters	8 to 24 hrs	Drift, some set net	Species include thresher and swell sharks.
Category II CA Yellowtail, barracuda, white seabass, and tuna drift gillnet fishery	White seabass, yellowtail, barracuda, white seabass, and tuna	Typically 6.5 inch	15 to 90 meters	8 to 24 hrs	Mostly drift net	White seabass predominant target species.

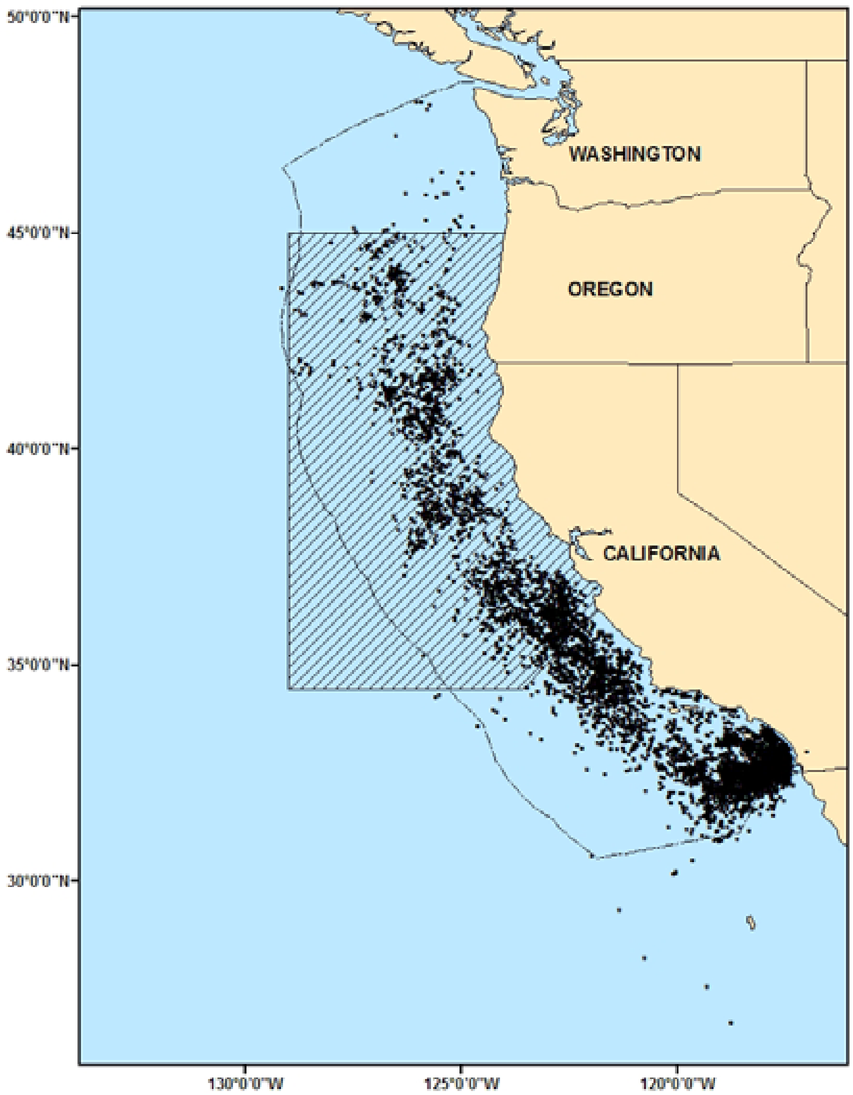

Figure 1. Locations of 7,660 sets observed in the California/Oregon large-mesh drift gillnet fishery for thresher shark and swordfish, 1990-2006. The cross-hatched area has been closed to gillnetting from 15 August to 15 November each year since 2001 to protect leatherback turtles. The outer dashed line represents the U.S. Exclusive Economic Zone. Total estimates of fishing effort over this period are approximately 48,000 sets.

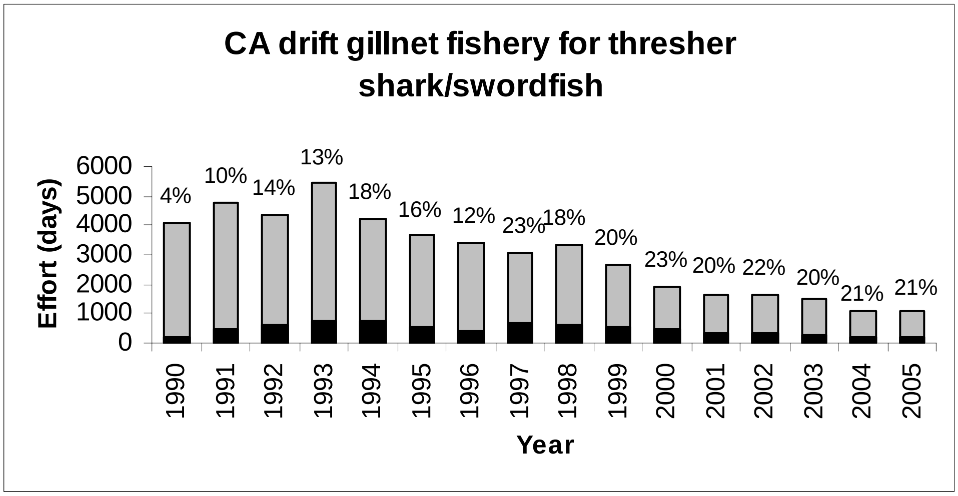

Figure 2. Estimated (gray) and observed (black) days of fishing effort for 1990-2005 in the California/Oregon thresher shark/swordfish drift gillnet fishery (≥ 14 inch mesh). One fishing day is equal to one set in this fishery. Percent observer coverage for each year is shown above the bars.

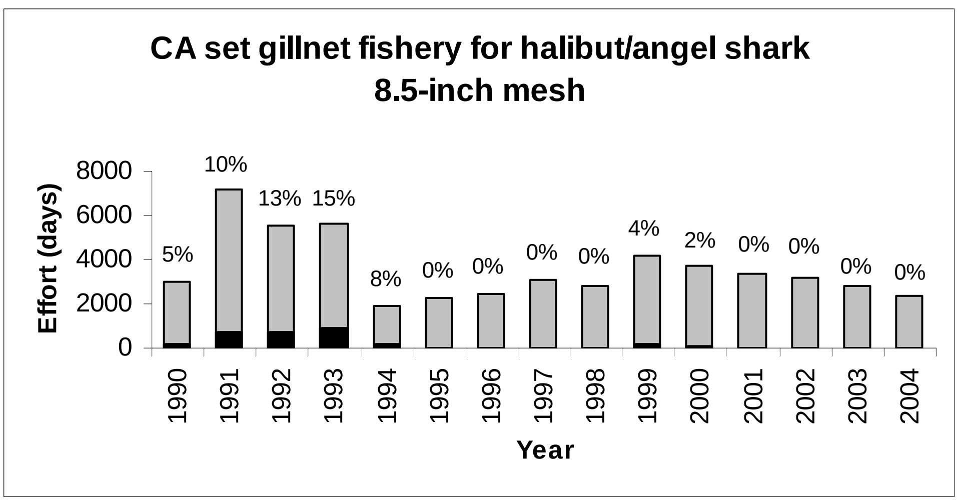

Figure 3. Estimated (gray) and observed (black) days of fishing effort for 1990-2004 in the California angel shark/halibut set gillnet fishery (> 3.5 inch mesh). The fishery was observed only from 1990-94 and again in 1999 and 2000 in Monterey Bay. Percent observer coverage for each year is shown above the bars.

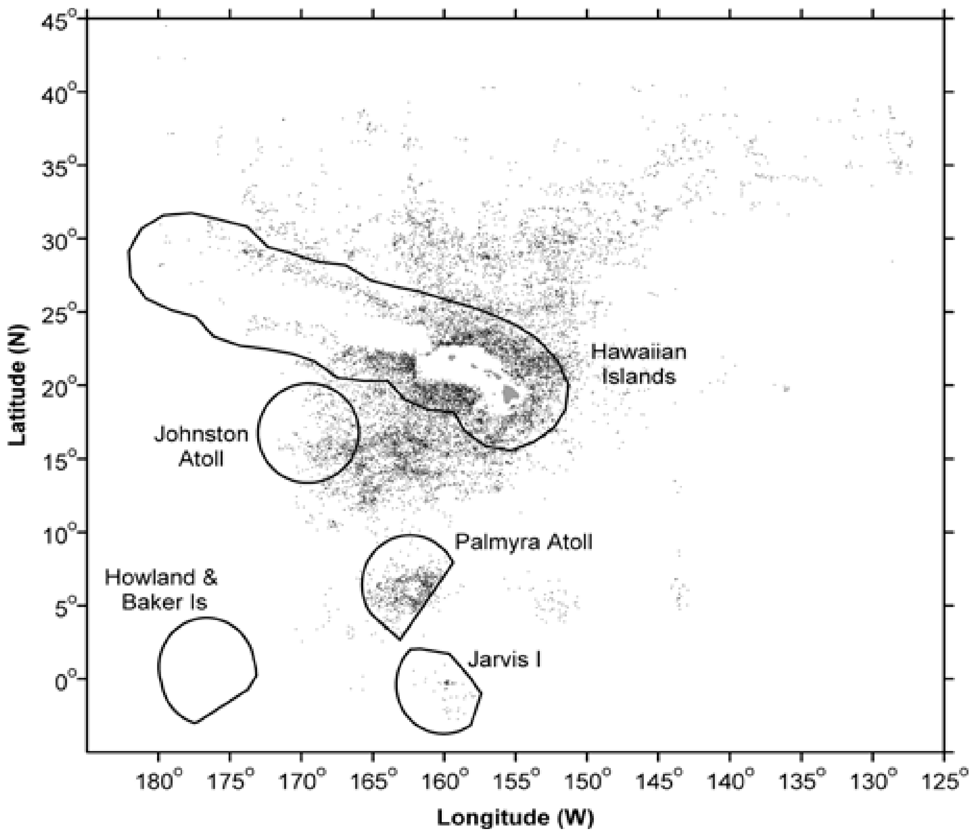

Figure 4. Observed set locations in the Hawaii-based longline fishery, 1994-2002.